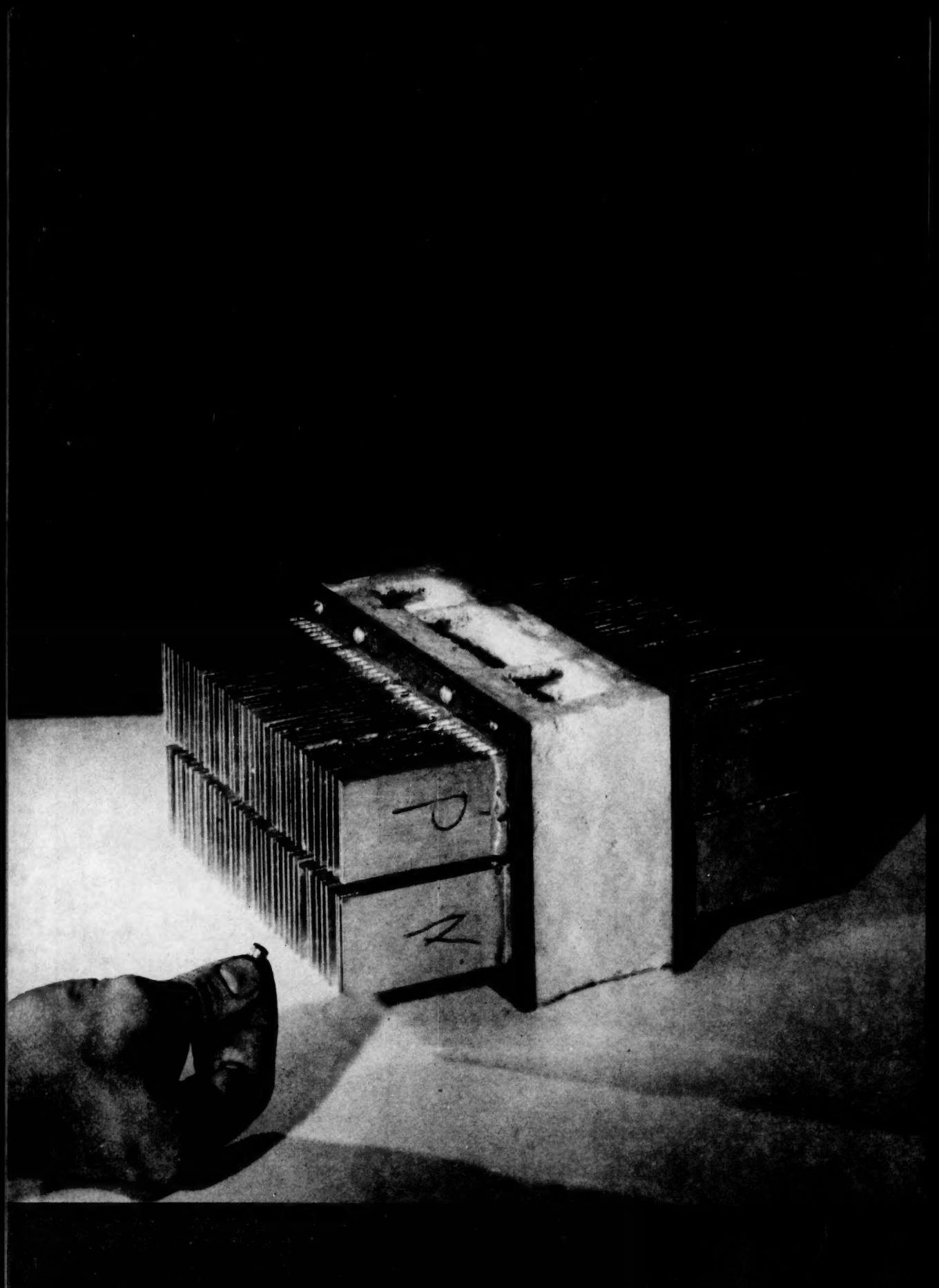
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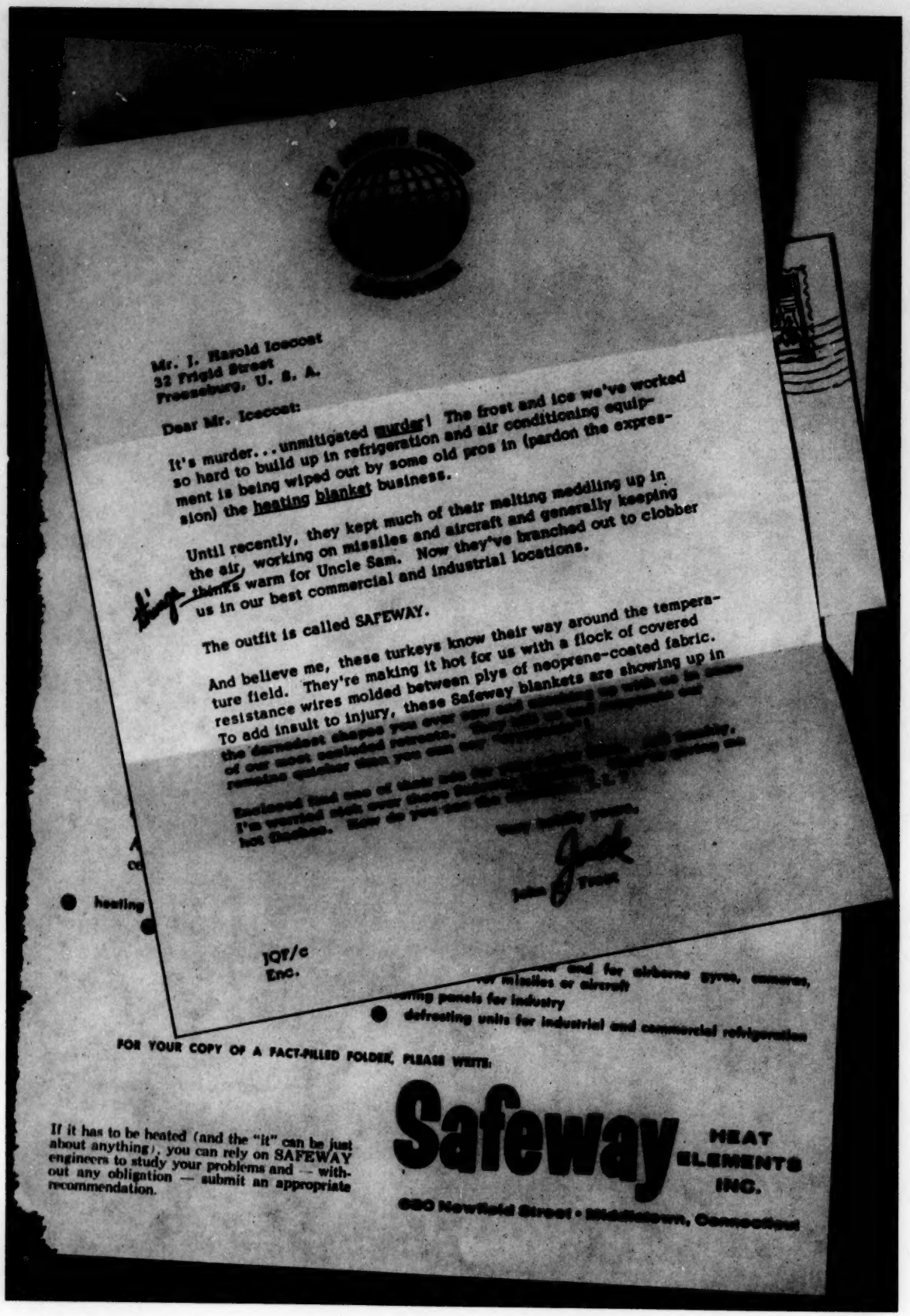


Mr. J. Harold Icecoat
32 Frigid Street
Freezeburg, U. S. A.

Dear Mr. Icecoat:

It's murder...unmitigated murder! The frost and ice we've worked so hard to build up in refrigeration and air conditioning equipment is being wiped out by some old pros in (pardon the expression) the heating blanket business.

Until recently, they kept much of their melting meddling up in the air, working on missiles and aircraft and generally keeping things warm for Uncle Sam. Now they've branched out to clobber us in our best commercial and industrial locations.

The outfit is called SAFEWAY.

And believe me, these turkeys know their way around the temperature field. They're making it hot for us with a flock of covered resistance wires molded between plys of neoprene-coated fabric. To add insult to injury, these Safeway blankets are showing up in the darndest shapes you ever saw and

JQF/c
Enc.

- heating
- for airborne tyres, cameras,
- missiles or aircraft
- panels for industry
- defrosting units for industrial and commercial refrigeration

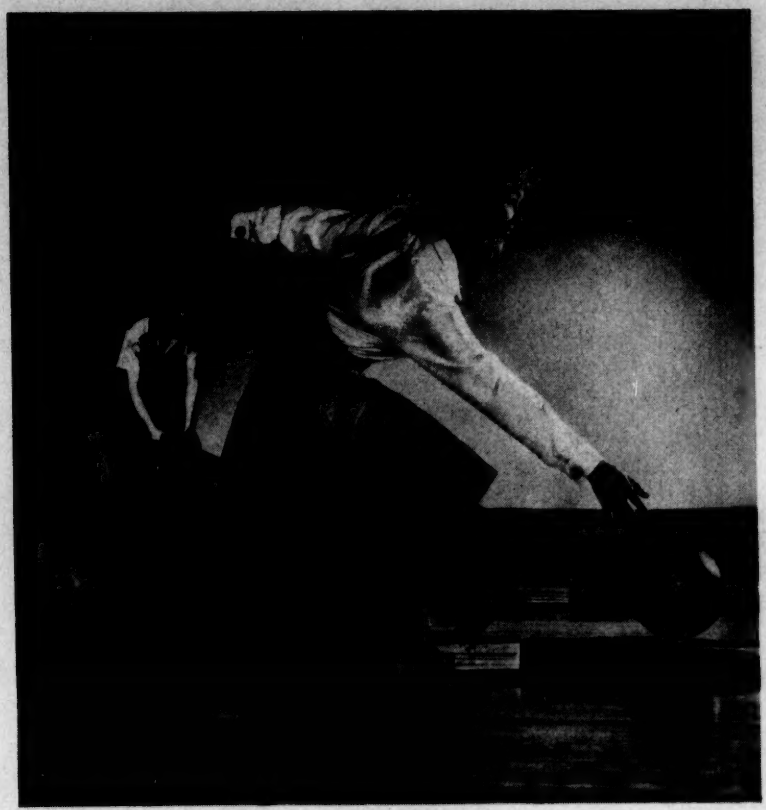
FOR YOUR COPY OF A FACT-FILLED FOLDER, PLEASE WRITE:

If it has to be heated (and the "it" can be just about anything), you can rely on SAFEWAY engineers to study your problems and — without any obligation — submit an appropriate recommendation.

Safeway HEAT ELEMENTS INC.

620 Newfield Street • Middletown, Connecticut

In bowling alleys and banks, bakeries and beauty parlors... You'll find



The popularity of bowling has increased so sharply in recent years that today more Americans actively participate in bowling than in any other indoor sport. Air-conditioned alleys have made it possible for bowlers to enjoy the game the year round.

genetron®

SUPER-DRY REFRIGERANTS

Approved! Accepted! Preferred!

In thousands of applications, you'll find "Genetron" refrigerants filling the air-conditioning and refrigeration needs of modern America. "Genetron" refrigerants offer unexcelled purity and dryness . . . and their strict quality specifications are consistently *bettered* in production. Leading equipment manufacturers, refrigeration engineers and air-conditioning and refrigeration wholesalers approve, specify and recommend them. They know they can always count on "Genetrons" for dependable, trouble-free service.

"Genetron" Super-Dry Refrigerants are available from wholesalers everywhere, coast to coast. See your wholesaler. Insist on "Genetron"!

genetron 11 ORANGE LABEL CCl_3F
TRICHLOROMONOFLUOROMETHANE

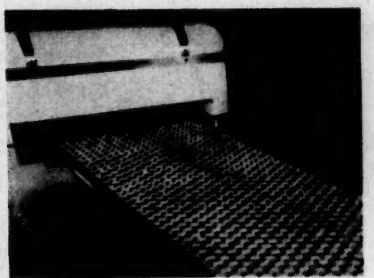
genetron 12 WHITE LABEL CCl_2F_2
DICHLORODIFLUOROMETHANE

genetron 22 GREEN LABEL $CHClF_2$
MONOCHLORODIFLUOROMETHANE

genetron 113 PURPLE LABEL $C_2Cl_3F_3$
TRICHLOROTRIFLUOROETHANE

genetron 114a BLUE LABEL $C_2Cl_2F_4$
DICHLOROTETRAFLUOROETHANE

Air-conditioning is a "must" inside bank vaults, museum and library storage rooms and other areas where, for security reasons, there are no windows or little air circulation. Precise control of temperature and humidity also protects important records against atmospheric variations.



Modern baking is a highly mechanized operation—far removed from grandma's oven. In this photo, crackers pour from the delivery end of an automated travelling oven. Air-conditioning is used in large commercial bakeries today to control temperature and humidity and for employee comfort.

It gets pretty hot under a hair dryer—even *with* air-conditioning. And the girls like to enjoy having their hair done. That's why so many beauty parlors are so well air-conditioned. It benefits customers . . . employees . . . *and* owners!

GENERAL CHEMICAL DIVISION
40 Rector Street, New York 6, N.Y.

Allied Chemical

MAY—Bought anhydrous ammonia after supplier's claim of dependable delivery . . . 1st shipment on time.

LATER—2nd ammonia shipment late . . . receiver almost empty . . . head pressure and efficiency dropping.

STILL LATER—Receiver empty . . . found compressors short-cycling and working overtime . . . power and water costs up.

TOO LATE—Still no ammonia! Cold room shut down, had to move perishables . . . operating costs up and profits down.

BE TROUBLE-FREE! Buy your ammonia from Armour —delivered on time, everytime, from any one of 171 distribution points!

ARMOUR AMMONIA DIVISION

1355 West 31st Street • Chicago 9, Illinois

Serving industry for more than half a century with the purest ammonia money can buy.

May, 1959

Number 5

Vol. 136

Industrial Refrigeration

Now in its 67th Year of Publication

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Correction On Royal Castle Story . . .

▶▶ EDITORS as a rule have a scrawling longhand and a very poor eraser. Managing editor of IR is no different. In his longhand, Lamb and Laub looked alike. Although Royal Castle staff called to our attention in plenty of time the mis-spelling of GERALD LAUB'S name on page 13, April issue, we did not take eraser in hand soon enough. For this oversight our regrets are doubled.

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COVER: Thermoelectric Mechanism For Refrigeration

▶▶ DEVELOPMENT of thermoelectric cooling devices is a national effort being carried on in laboratories of many manufacturing firms as well as in research institutions. Thermoelectric home appliances were shown in exhibits by ASRE last Fall at New Orleans and by the AIEE in Washington, D.C. this past Winter. A source of direct current is all that is required and there are no moving parts.

Historically, the industrial refrigeration plant was adapted to the commercial application and then to the household appliance. Application of thermoelectric refrigeration, however, appears to be starting at the appliance level, to be further developed for commercial and ultimately industrial uses.

The Peltier effect, upon which all thermoelectric cooling devices are based, is produced by energy changes in electrons as they pass across the junction between two dissimilar thermoelectric materials. Size of such junctions is shown by the pellet held between the finger and thumb in the photograph.

Cover photo courtesy of Whirlpool Corporation.

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news briefs of the month

USN BuShips Orders Thermoelectric Generator

Fabrication will begin immediately on a 5,000-watt thermoelectric generator for the USN Bureau of Ships. The unit will transfer heat immediately into electricity in this instance, as compared with thermoelectric mechanisms which transform electricity directly in the heating or cooling. The contract was awarded to Carrier Corp.

Basic principles of thermoelectricity have been known for more than a century, but only recently have improved designs and materials called semiconductors made this remarkable source of electric power practical outside the laboratory. Thermoelectric generators have no moving parts and are, therefore, difficult to detect.

Seattle Modernizes Cold Storage Pier

Port of Seattle Commission approved on April 10, a new lease with Rainier-Port Cold Storage, Inc. which calls for modernization of the cold storage plant at Pier 24. Lease on the six-story building is for five years with option on renewal for 15 years more. Modernizing work will exceed $600,000 and the cold storage firm will pay rental ranging up to $80,000 annually.

Packing Corporation Joins Philadelphia Center Tenants

Triple M Packing Corp., reported to be one of the five largest terminal packagers in the country, is still another firm to sign an agreement to build in the new Food Distribution Center at Philadelphia. INDUSTRIAL REFRIGERATION was informed by special release from the PHILADELPHIA INQUIRER RETAIL MEMO, on April 15, that Triple M Packing Corp., will combine a packaging plant and headquarters in a $350,000 building. Philadelphia planners appear to be reversing the current trend to de-centralize.

Option To Lithium Corp. For American Ice Control

American Ice Company which acquired voting control of U. S. Cold Storage Co. in February (see INDUSTRIAL REFRIGERATION, page 5, February 1959), may itself come under the control of Lithium Corp. of America, sometime between November 1 and December 15, according to a report early in April from the WALL STREET JOURNAL. The chemical firm entered into this option to purchase American Ice common stock, with the Delaware Midland Corp. Lithium Corp.'s interest in American Ice and U. S. Cold Storage is explained in the option prospectus as "enhancing working capitol and borrowing power for the purpose of increasing its lithium and chemical business".

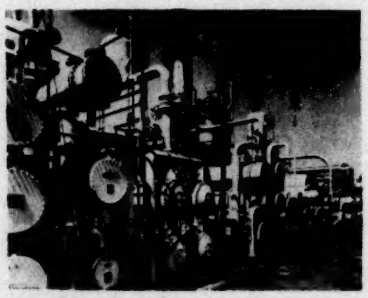
Wenatchee Warehouse Advertises For Bids

Wenatchee Wenoka Growers Association advertised for construction bids on a 100,000 square foot warehouse and cold storage building in Wenatchee, late in April. According to the architect, H. Lloyd Ulrich of Yakima, the facility will consist of two parts, a 100x250-ft cold storage building and a 200x360-ft packing area. Intended to handle 200,000 boxes of loose fruit, the building will accommodate six fruit packing lines.

Credit Department:

▶▶ **April issue,** IR failed to carry a credit on the cover photo. Illustration was thru courtesy of Reynolds Metals Co., Richmond, Virginia. The editorial staff regrets the oversight.

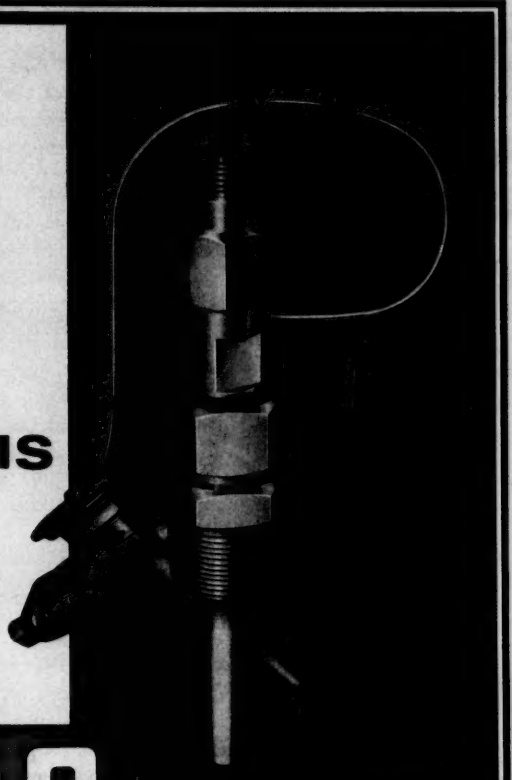
Proof that aluminum usage is becoming more widespread is given in a release by the Aluminum Association, April, which showed an all-time record quarter of 456,000 tons for the first quarter, 1959. This represents an increase of 5200 tons over last year.



maintain

CONSTANT LIQUID LEVELS for ALL FLOODED SYSTEMS

with the SPORLAN LEVEL-MASTER CONTROL



LMC

LEVEL-MASTER CONTROL

Modulated flow action . . . not ON or OFF

The LMC is a combination of a standard Sporlan thermostatic expansion valve and a Level-Master Element. The element consists of an insert bulb containing a low wattage heater. It assures a positive liquid level control for all flooded systems.

The LMC feeds with a modulated flow, and maintains a constant liquid level to meet varying load conditions.

The insert bulb controlling the liquid level has no moving parts . . . is not a mechanical float device.

It can be easily and economically installed directly in the shell, accumulator or liquid leg of any coil designed for flooded operation, whether it be a new or converted installation. The bulb must be in direct contact with the refrigerant.

Regardless of application or refrigerant, get Peak Performance on all flooded systems with the Sporlan LMC

For complete details on the Sporlan LMC, ask your Sporlan Wholesaler for Bulletin 60-15.

Our 25th Anniversary . . . 1934-1959

SPORLAN VALVE COMPANY

7525 SUSSEX AVENUE ST. LOUIS 17, MO.

EXPORT DEPT. 85 BROAD STREET NEW YORK 4, N. Y.

What's New

MACHINERY
APPLIANCES • PROCESSES

More Plastics Introduced to Refrigeration; New Transportation, Air Conditioning Ideas

▶▶INTEREST IN PLASTICS and their application to the refrigeration and insulation field continues to grow. April issue of INDUSTRIAL REFRIGERATION had hardly been prepared for the printer when more material was received on foamed resins for insulaion applications and unplasticized polyvinyl chloride pipe and fittings for brine solutions.

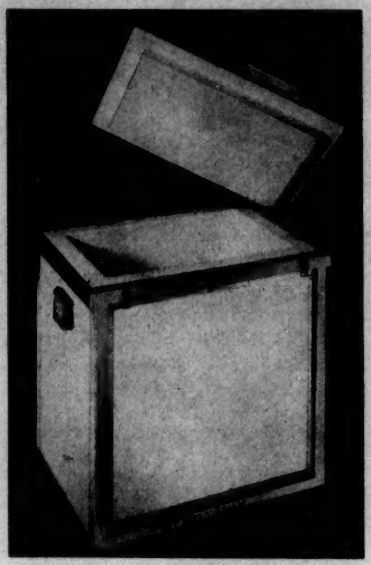
UPVC For Brine Piping

▶PATRICK CUDAHY CO., Cudahy, Wisc., annually replaced a goodly amount of steel piping in their sweet pickle brine solution system. An alternative considered for a number of years was the use of stainless steel in this brine system serving the bacon and ham curing operations. Recently, injection-molded valves and fittings, and piping of unplasticized vinyl chloride (UPVC) replaced the existing steel piping and is said to have eliminated corrosion.

Lower initial cost, ease and economy of installation, and virtual elimination of maintenance and replacement costs in the foreseeable future, are cited by Cudahy for its switch to UPVC. Where carbon steel pipe had to be replaced almost every year, the UPVC pipe and fittings with their exceptional resistance to chemical corrosion, have needed neither maintenance nor replacement in the two years since first installed.

UPVC withstands corrosion both inside and out, it is being demonstrated. The plastic system is exposed to exterior corrosion because of its installation directly in brine tanks, under the ham pumping conveyor lines and in areas where brine and humidity create corrosive atmospheres. Inside, the plastic piping system contains the sweet pickle brine solution with its measure of tripolyphosphate at 35F and 90 psig.

Frozen Food Transporter



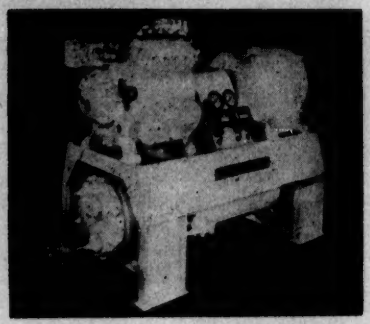
▶PLASTIC FOAM, portable, frozen food transporter named the *Freez-Safe* is now available from Glo-Brite Products, Chicago. According to the manufacturer, the transporter when loaded with frozen foods will keep the contents solidly frozen and within a few degrees rise for approximately three days.

Transporter weighs only 14 pounds with net cubic dimensions of 23x14x23 in. It is claimed to accommodate up to 175 lbs of frozen foods. Offered in several types of outer shells such as plastic, aluminum or stainless steel, the light weight and insulation efficiency of this refrigerationless unit is attributed principally to the foam insulation core.

▶A PITTSBURGH FIRM, outstanding in its production of plate glass for industrial applications and for the automotive field, recently announced an experimental foamed insulation product for use in building panels, cold storage rooms and refrigerated transportation vehicles. The firm has previously developed and marketed *Selectrofoam* for the insulation of original equipment in the domestic refrigerator and freezer lines. Price lists and literature on this firm's products are available.

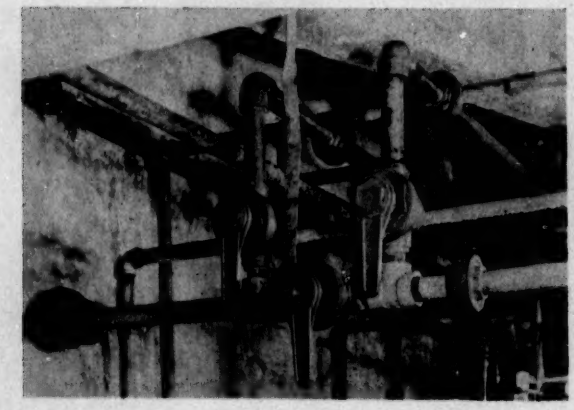
▶MENTION OF NEW TYPES of polyethylene, polystyrene and polyurethane foams generally suggests some reference to the originators of this versatile product line. Dow Chemical Company, Midland, Michigan is credited with being the first developer of the foam type insulation product. Their material is a polystyrene known as *Styrofoam*.

Condensing Line By Bell & Gossett



▶COMMERCIAL and industrial refrigeration condensing units to 150 tons capacity have been announced by Bell & Gossett Co., Morton Grove, Ill. Four compressor sizes, 2, 4, 6 or 8 cylinders, are available. Built low and compact, the units are claimed to be the shortest available on the market today.

The new condensing units are designed specifically for refrigeration and air conditioning in industrial plants, hotels, apartment buildings, super-markets and other installations where a large cooling capacity is required. Moving parts and controls are located where they are easily accessible and can be serviced with ordinary tools.



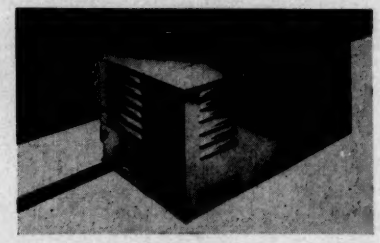
Improved Equipment By Truck Unit Builders

▶PROPOSED Frozen Food Code by AFDOUS may not have prompted some of the standardization now taking place in industry on the manufacturing of truck-trailer units. Nevertheless, consideration of a code acceptable to all segments of the frozen food industry and its subsequent adoption by various regulatory bodies appears to have stimulated considerable improvement activity from the body builders back to the refrigeration equipment manufacturers.

In Los Angeles, Calif., one manufacturer has recently introduced a 7½-TR engine driven refrigeration unit which they claim can maintain temperatures of minus 15F indefinitely, no matter what the outside temperature might be! Tests recently completed seem to back up their claims. The complete plant, consists of a condensing unit mounted beneath the trailer and the evaporator mounted in the nose of the van. Motive power is furnished either by gasoline or lpg 31-hp engine and three-cylinder refrigerant compressor, plus a generator for the evaporator fan.

▶IN MICHIGAN another truck equipment maker believes that a truck refrigeration system should be split a little differently. In their last adaption, the condenser is mounted above the cab on the outside of the forward wall of the truck body. The compressor compartment is mounted on the chassis rail.

Over-the-cab location of the condenser, according to this manufacturer, is desirable for severe service conditions which may be encountered in certain geographical areas, like exceptional road dirt. Air is taken through the front of the housing and exhausted to the side.



Power for the compressor is derived from the truck engine crankshaft, transmitted through the flexible shaft and cushioning electric clutch. Skirt mounted compressor compartment, completely enclosed houses the jackshaft, electric clutch, compressor, electric motor to drive the system on standby, and a dc generator and voltage regulator.

Dual Purpose Alternator Featured For RR Reefers

▶ADDED FEATURE to a new line of railroad reefer units recently developed by a leading New York equipment manufacturer, is an alternator with a dual function. Usually driven by belt from the main power drive (as pictured) to provide current for the condenser and evaporator fans, this alternator (2) becomes a motor and drives the compressor on the same belt when standby electric power is used. The coupling (1) which joins the diesel compressor shafts in direct line during over-the-road operations, is disengaged when the equipment is on electric standby.

Fuel saving and better humidity control is also claimed for these units which include 2, 3 and 4 cylinder compressors, which selection depends on the size of the car and the desired temperature range. To maintain temperatures at above freezing levels when the weather is cold, hot refrigerant gas is diverted to a patented heating system within the car. Seven units have been in continuous operation by four major car builders, and some have been successfully in service for as long as a year. Customers have ordered 750 units.

Improvements Effect Two-Way Economies

Diesel fuel economy is said to be achieved in two ways. First, efficiency is gained by eliminating an electric generator-motor transmission by powering the compressor directly from the diesel. A smaller diesel may be used. Secondly, when a system is not under full refrigerating load, a special set of controls drops the diesel engine speed to the most economic "cruising" level.

Further, the controls unload some of the refrigerant compressor cylinders. Once a unit is put into operation it controls diesel speed, number of compressor cylinders, switches from cooling to heating and back again, unattended. Variation of diesel and compressor capacity permits less temperature difference across the evaporator coils, which is said prevents dehydration in the car.

Controlled Humidity

▶CONSIDERABLE discussion took place at the TRRF-NARW meetings with regard to dry-cold or low humidity storage for certain commodities. Niagara Blower Co., last Winter announced a new controlled humidity method or model of dehumidifying unit. Applications of the equipment were said to have been proven indispensable where precise humidity conditions and complete reliability were required. Moisture is removed directly from atmospheric air by means of a liquid absorbent spray in the air stream. Temperature of the spray determines the dry bulb temperature of the air leaving the unit. Concentration of the absorbent liquid controls the air's dew point temperature, fixing the RH.

Automatic control of temperature and relative humidity is secured by thermostats, no moisture sensitive instruments being required. Concentration of the absorbent, obtained by continuously cycling of the diluted absorbent through a concentrating unit, removes the water from the system.

Air Distribution Device

▶HIGH VELOCITY room terminals for all air systems were announced by a pioneer air conditioning manufacturer. Known as *Weathermaster* blending boxes, these terminals are suitable for both exterior and interior spaces of offices, hospitals, hotels, schools and laboratories. Three models handle from 50 to 1700 cu. ft./min. Pictured is a unit for a double duct system. All model lines are said to have large sound absorbing surfaces, angled air flow, baffles and diffusers for thoroughly mixing hot and cold air, and muffling out operating noises. Sliding dampers are direct connected to regulating valves.

▶VARIABLE FLOW INDICATORS were introduced by a New York firm for installation in liquid systems ranging from 3/4 to 24 gpm in 1/2- to 1-in ips; and from 3/4 to 120 gpm in sizes up to 3-in ips. The liquid as it passes, spins a chromium plated ring under a glass dome. When the flow stops the ring stops spinning and warns that the liquid is not circulating. It is claimed the movement is so decided that it cannot be mistaken or misread, and may be seen even in bad light.

Continued On Page 35

Public Warehouse By-Passes Wholesaler

Distribution Savings Passed To Frozen Food Consumers

Lot receipts, made out by the receiving clerk when shipment is received from frozen foods processor, are sent to the accounting office where the clerical assistant then enters codes and other information on that form.

Using information on the lot receipt, the clerk makes up a three-part warehouse receipt. Zipset form is stubbed at the right and an extra carbon glued in. Lot card can be slipped in from the side and produced simultaneously.

By A. R. CARSTENSEN, President
The Crystal Ice & Cold Storage Co.
Sacramento, California

Delivery orders are produced on continuous forms, in the accounting machine, and entries are made simultaneously on the lot card. A split platen is used. Standard Register Platen with circumferential pins moves the continuous, marginally punched forms through the machine in preset increments, while the right-hand platen advances a line at a time. By actuating the Automatic Linefinder, operator advances the continuous forms, as shown here.

▶▶▶SIMPLIFIED PAPERWORK PROCEDURES that permit more complex in-and-out warehousing flow are helping cut costs sharply in the distribution of frozen foods throughout much of northern California. The end result has been lower prices for the housewife and, consequently, significantly increased sales of frozen foods by the retail grocer.

Voids Wholesalers' Need For Refrigerated Storage

The way in which it is being accomplished is through by-passing the wholesaler's warehouse by making possible the delivery of frozen foods direct to the retail grocer from the public warehouse!

No matter how small the order, the wholesaler may now pick up the exact amount at the public refrigerated warehouse and deliver it direct. The intermediate steps in a conventional operation—the pickup by the wholesaler of quantities sufficient to satisfy several orders, the transfer of these quantities to his small warehouse, the division of these quantities into the proper quantities desired by each individual retailer, the reloading and the delivery—have been eliminated. The savings that have been passed on to the customer are impressive.

Combination of Delivery Preparation Service With Modern Mechanized Bookkeeping Voids Refrigerated Handling At Wholesale Level

So successful has the system proved out in a few months that other phases of one refrigerated warehouse business have had to be discontinued to make room for more frozen foods storage. Although the Author's firm is primarily in the business of storing frozen foods, it does have a thriving ice business, and in the past, has handled a large tonnage of cannery fruit in storage. In 1956 the firm was obliged to drastically reduce the tonnage of fruit handled.

Paperwork Deluge Threatens

In the subject type of operation, frozen food processors ship and store food in a Sacramento warehouse for withdrawal by wholesale grocery companies or their customers. When launching the new delivery arrangements, the warehouse had to meet the threat of infinitely increased paperwork burdens. Deliveries would be made in smaller lots, and much more frequently; and, the total order in each case would be composed of more, though smaller, units. If every delivery were to bring down upon the warehouse a whole new stack of paperwork, the system was liable to fall beneath its own weight.

Mechanized Office Age

To prevent this, a method of recapping individual deliveries to weekly totals for the wholesaler was developed. This was instituted along with a general revision of customer accounting methods and office equipment mechanization.

Making the recaps themselves actually is now only a relatively small step in the over-all job of revenue accounting; but if the latter had not been streamlined and improved, the recapping would have been difficult to set up. The complete sequence of paperwork entries is organized to give a continuous flow from the receipt of the merchandise in the warehouse to its delivery, the storage billing, the rendering of statements, and the reconciliation of records with physical inventory.

Under the system, which was set up with the help and counsel of forms experts from The Standard Register Company, when an incoming delivery arrives, the warehouseman completes a **lot receipt ticket.** This is a simple form in triplicate, padded into books, on which a lot number is prestamped.

Receiving Data

The warehouseman fills out date, code numbers, customer, from, identification of carrier, item, reported number of packages and bundles and number actually received, brand, size, package weights—net and gross, cubic measurement, room and aisle number, processing type, remarks.

Parts 1 and 2 are taken out of the book and sent by pneumatic tube to the accounting office, where they are audited and checked for nomenclature and the information transcribed onto a **warehouse receipt** form and **lot card.**

The warehouse receipt is a non-negotiable document, printed in triplicate. The three parts are bound together as a Standard Register Zipset being held by a stub which runs vertically along the right-hand edge. The Zipset also contains interleaved, one-time carbon sheets, one of which is doubled so that the lot card, which is inserted from the right-hand side, will also take an impression when the entry is made on the warehouse receipt.

The office clerk enters the date, account, lot number and other identifying information from the lot ticket, as well as tariff item number and storage rates as set by the California Public Utilities Commission. The clerk also enters the date and total number of cases.

Acknowledgment

The receipt is given to the customer, but Part 2 is pulled out and retained in the office, being filed away by lot number. The lot card goes into the accounting file and becomes the basic inventory record of this lot. It also serves as a billing source.

Deliveries

Each time an order is received authorizing delivery of the goods from the warehouse, a clerk writes a **delivery order** and posts from it to the lot card in the bookkeeping machine. This gives a running inventory, within the particular lot, on the lot card. The old balances in units and weight are set into the machine, and date, delivery ticket number, units, and weight to be delivered are posted. The machine automatically computes a new balance.

Multi-Operation Machine

At the same time a 5-part **delivery receipt** is produced in the bookkeeping machine, which makes use of a split platen for simultaneous feeding of forms, side by side, at varying rates of flow. The delivery receipt is fed through the machine on a Standard Registrator Platen, which is fitted with two rings of pins which ride in marginally punched holes in the sheets for perfect alignment. An Automatic Linefinder mounted on top of the carriage automatically advances the sheets to new preset positions at the will of the operator.

Posting

To make his entries in the delivery receipt and simultaneously post to the lot card, the operator enters all identifying information, then enters the withdrawals, which post to the lot card and are subtracted from the old balance to obtain the new one.

The first copy of the delivery receipt is a vellum master, which is suitable for feeding into a photographic reproduction machine should extra copies be needed. They are seldom required, however, since the other four copies are sufficient in at least 80 per cent of the cases.

The first copy remains in the office, the four copies being sent to the warehouse office by pneumatic tube. When the order has been filled, the warehouseman notes this fact on the sheets, gives one to the driver, and returns all but one of the remainder to the office.

. . . More

Recapping of individual withdrawals against one supplier's goods saves multiple entries on the bookkeeping machines, cuts out much unnecessary paperwork. — *All photos courtesy of the Standard Register Co.*

As in-and-out shipments continue during the month, the record of day-to-day shipments is kept on the lot card. This card is actually a customer ledger sheet: each month's bills are rendered from it.

Invoicing

Storage is charged for on the basis of 30-day periods. Invoicing, however, is done on a cycle basis. Five cycles, spaced at approximate 6-day intervals, are used. To facilitate the locating of the proper group of lot cards for any one cycle, Standard Register Company designed the cards with notches along the bottom edge. Each card is notched at one of five positions. All cards with matching notches are billed in a single cycle.

Invoices have also been designed by Standard Register as continuous forms with holes punched in the margins, and these are also produced on the Registrator Platens in the bookkeeping machines. From the lot cards, the records' balances are entered on the form, along with the rates, and the month's charges.

Statistical Sidelight

A selected 5-channel by-product tape is obtained and sent to a local service bureau where statistical information and reports are run to provide a breakdown by classifications of revenue and lot activity. Future reports will be added as experience dictates. The tape contains (1) original size of lot number, pounds, and packages, (2) size billed in pounds and packages and dollars by lot number, and (3) cold storage tariff item number.

Other Side Benefits

Each invoice may combine several lots, but on the other hand, there may be several invoices for one customer. Therefore, a **statement** is created as a by-product of the invoice which bears the date of the charges, the reference, charges, credits, and balance. In preparing the statement, the operator collates it with an **accounts receivable card** and simultaneously creates the invoice and two back sheets in the machine. This also provides a customer ledger.

The **customer ledger** carries listing of dates and invoice number, charges, credits, previous balance, and new balance. The machine automatically figures these amounts and makes extensions.

Old System Handicaps

It was into this paperwork system that the recap method of charging out deliveries was fitted. **Wholesale grocers now send in their delivery orders, and from these the shipments are made to individual retail outlets.** But instead of posting each delivery to the lot cards, which would overburden them with entries and jam up the accounting office, a system of recapping them has evolved, and posting is direct from the recap sheets rather than from delivery tickets.

Recapping under the old system would have been very difficult. Separate lot folders were kept into which warehouse receipts were placed; individual delivery tickets were made up representing withdrawals from each lot. Posting was manual.

For a moderately sized operation, the system was working well, but an expanding frozen food storage began to outgrow it. But with the new setup, which involves 50 per cent more customers than were formerly involved and has increased delivery orders by 150 per cent, it would be inadequate.

On the other hand, with the new paperwork system, changeover to the recapping method did not entail any great increases in clerical work. Yet the effect on the market was marked.

Delivery Methods Boost Sales

Supermarket retail outlets have taken to buying in case lots rather than simply buying a few packages at a time. The increased savings brought on by the by-passing of the wholesaler's warehouse have been passed along to the customer, with the result that per capita consumption of frozen foods increased notably.

The entire accounting setup that was installed when the Author's warehouse went to mechanized accounting has been an important factor in increasing operations efficiency. By careful dovetailing of forms so that several could be collated at each operation, the chance for errors have lessened and saved extra writings.

Refrigeration For Permafrost

Coals To Newcastle?

▶▶▶ REFRIGERATED FOOTINGS are used by Army Corps of Engineers for Armed Services buildings in permafrost areas of operations, to maintain a balance between the freeze-thaw cycle. "Refrigerated Foundations in Permafrost" is the title of such a discriptive article by Donald H. Henderson, Major, C of E, USA, in a 2-page illustrated feature in the March-April 1959 issue of the MILITARY ENGINEER. Major Henderson describes a switch from the insulated ventilated foundation structure to the refrigeration method of maintaining a stable base for permanent buildings in the arctic areas.

Refrigerant type coolant is circulated through grids and maintains foundations in permafrost at a constant temperature below freezing. This prevents any thawing of permafrost beneath the foundation, with subsequent settling and break-up of the building structure. Construction in the arctic must rest on permafrost. The problem of the design engineer is to provide foundations which would remain stable. Each summer an average of five feet of the ground thaws, and each winter it refreezes. Thus foundations upon permafrost were very instable.

Previous Method Followed Frost Heave Prevention

Early construction involved the placing of pads of non-frost susceptible materials over the permafrost to a sufficient thickness that annual thaw would not penetrate through the pad to the permafrost. To further prevent any heat transfer, the structures were insulated from the pad.

The Corps of Engineers, USA, devised a refrigeration method which avoided excavation into the permafrost which would be necessary to provide thick insulating pads. A refrigeration system was designed to offset the heat transfer to the foundation by the interior building temperatures which range from 20 to 70 F. Circulating coolant is between 18 and 20 F. Grids are made up of 3/4-in pipe spaced from two to three feet on centers. The system is thermostatically controlled for circulation.

Coolant solution is propylene glycol and water. Components of the refrigeration system include two air-cooled condensing units, two shell-and-tube liquid chillers, liquid circulating pumps, thermostatic controls and remote temperature indicators. Condensing units are connected in parallel and controlled by suction pressure switches. By-pass piping is arranged so that any portion of the system may be isolated for repairs.

Progressive Business Enterprises Gauged By Their Scientific Activity

The Refrigeration Research Foundation Meets

By RICHARD L. FRANCIS
Staff Feature Writer

▶▶▶ PARTNERSHIP of science and industry is generating a striking advance in human welfare, said Samuel Lenher, vice-president and director of the executive committee of the DuPont Co., when he addressed the Contemporary Trends Course at the University of Wisconsin on April 7.

On the same date the National Association of Refrigerated Warehouses, Inc., opened their Operations Business Session in Washington, D.C. One of the speakers that day, Paul A. Vollmer, vice-president, Produce Terminal Cold Storage Co., Chicago, emphasized the fact that too few of the 450-odd NARW members showed appreciation for the work of The Refrigeration Research Foundation, which is supported by less than one-third of that industry.

Lenher pointed out in his lecture at U. of W., that science and industry each supports and stimulates the achievements of the other. Nearly every scientific discovery is translated by industry into technology and products available to mankind. Nearly every advance in technology suggests to science a further trail to be explored.

The description fit identically the conferences and reports of TRRF, meeting the week before in D.C.

Since the beginning of the century, Lenher told the Contemporary Trends audience, industry is increasingly turning to science in search of ways to operate at a profit. The yield from this partnership of science and industry is an economy of unprecedented abundance instead of scarcity.

Lenher and Vollmer could conceivably have exchanged speaking assignments for that day. Lehner predicts a thrilling decade for those industries working hand in hand with research and science. It remains to be seen whether or not the public refrigerated warehouse industry heeds Mr. Paul Vollmer's remarks, and utilizes the findings of TRRF to make their's the same sort of thrilling and financially successful decade.

First step toward that realization, apparently, is the move to hold TRRF meetings concurrently or interleaved with NARW sessions in 1960.

Scientific Advisory Council, TRRF, meets with warehousemen sponsors.

▶▶▶ FREEZE-DEHYDRATED FOODS were the subject of the opening session, Scientific Advisory Council, The Refrigeration Research Foundation when this group met in Washington, D. C., at the Sheraton-Carlton Hotel, April 2. Three additional Scientific Advisory Council sessions dealt with time-temperature-tolerance of frozen foods, heat transfer aspects of packaged goods, and packaging pitfalls, the latter two meetings being held on April 3.

Four research projects were reported on at the Foundation membership meeting April 4. They dealt with irradiation experiments on chicken, frost formation on refrigerated coils, refrigerated storage of sterilized foods, and condensation control on refrigerated commodities. Reports were made by the Foundation's Chairman, Associate Chairman, President, Treasurer, and Director. Election of certain governors and new officers followed.

Young Succeeds Shoemaker

Millard W. Young, Pres. and Genl. Mgr., National Ice & Cold Storage Co. of California was elected President, TRRF. He succeeds Garth A. Shoemaker, Executive Vice-president and treasurer, Hygeia Refrigerating Co., Elmira, N. Y., who had completed a second term.

Vice-president is Franklin (Duke) Newell, Mgr., The Minneapolis Cold Storage Co., Minnesota, succeeding Paul D. Burrill, Vice-president, Quincy Market Cold Storage & Warehouse Co., Boston. Both Young and Newell are past presidents of the National Ass'n. of Refrigerated Warehouses.

Other officers of TRRF for 1959 are Treasurer, Gilbert J. Stecker, President, Merchants Ice & Cold Storage Co. Inc., Louisville, and Secretary and Director, Dr. Walter A. Maclinn; the former serving a second term and the latter starting his first full term. Maclinn succeeded H. C. "Dutch" Diehl in October 1958, when Diehl retired after 15 years as Director of the Foundation.

Sixteenth Term For Prescott

Dean Samuel C. Prescott, Emeritus Dean of Science, MIT, was re-elected Board Chairman; his 16th term. Associate Chairman is Dean Wm. A. Schoenfeld, Emeritus Dean and Director, Oregon State College, another re-election.

Dr. Laurence V. Burton, Packaging Engineer, Dr. Louis B. Howard, Dean and Director, Illinois Agricultural Experiment Station, and Col. P. O. Logan (retired), former Research Director, National Restaurant Assn., were also re-elected. Together with Prescott and Schoenfeld, they represent the Public on the Foundation's Board of Governors (there are still two vacancies in this Public representation).

Representing Industry are 21 Governors, serving three year terms. Newly elected (terms to expire in 1962) were J. F. Meagher, Balto., and William Giacomazzi, Jr., San Jose; the other governors with the new three year terms being re-elected. F. D. Newell and D. H. Sanders, Omaha, were elected to fill unexpired two-year terms, where resignations had taken place. . . . More ▶

The Executive Committee, TRRF, for 1959 will include, in addition to the Foundation's President, Vice-President, and Treasurer, Governors Shoemaker, W. C. Baker, Straub, Burrill, Phil Kuehn, and Kadane. Governors are listed below:

REPRESENTING THE PUBLIC

Dr. Lawrence V. Burton
Packaging Engineer, Scarsdale, N. Y.
Dr. Louis B. Howard
Dean & Dir., Ill. Agr. Exp. Sta.
Col. Paul P. Logan, USA (Ret'd)
(Formerly) Res. Dir. Nat'l. Res't Assn., San Francisco
Dean Samuel C. Prescott
Emeritus Dean of Science, MIT, Cambridge
Dean Wm. A. Schoenfeld
Emeritus Dean & Dir., Ore. Agri. Exp. Sta.

REPRESENTING THE INDUSTRY

Terms Expiring in 1960

John L. Bear, Pres.
Kansas C. S. Inc., Wichita
Paul D. Burrill, V.P.
Quincy Mkt C. S. & Whse Co., Boston
Sheffied A. Kadane, Owner
Pure Ice & C. S. Co., Dallas
Franklin (Duke) Newell, Jr., Mgr.
The Minneapolis C. S. Co., Minn.
James C. Rear, V.P.
Union Ice & Stge. Co., San Francisco
D. H. Sanders, V.P.
Omaha C. S. Co., Nebr.
James W. Straub, Exec. V.P.
Merchants Refrigerating Co., NYC

Terms Expiring in 1961

Wm. C. Baker, V.P.
Produce Term'l C. S. Co., Chgo.
Wm. B. Haggerty, Pres.
Tampa C. S. & Whse Corp., Fla.
Phillip G. Kuehn, Pres.
Wisc. C. S. Co., Milw.
Curtis F. Lewis, Gen'l Mgr.
Cinn. Term'l Whses., Ohio
A. W. Oakley, Jr., V.P.
Hudson Refrigerating Co., Jersey City
Gilbert J. Stecker, Pres.
Merchants Ice & C. S. Co., Louisville.
Millard W. Young, Pres.
Nat'l Ice & C. S. Co. of Calif., San Francisco

Terms Expiring in 1962

C. A. Bowen, Jr., Pres.
Noel & Co. Inc., Nashville, Tenn.
Wm. F. Giacomazzi, Jr. V.P.
Modern Ice & C. S. Co., San Jose, Calif.
Frank L. Lockwood, C. S. Mgr.
Central Service Co., Des Moines, Ia.
Wm. E. Martin, Pres.
Vancouver Ice & C. S. Ltd., B. C., Canada
J. F. Meagher, Gen'l Mgr.
Merchants Term'l Corp., Baltimore
Wm. J. Rylee, Pres.
Atlantic Co., Atlanta, Ga.
Garth A. Shoemaker, Exec. V.P.
Hygeria Refrigerating Co., Elmira, N. Y.

G. A. Shoemaker

Dr. S. C. Prescott

Dr. W. A. Schoenfeld

Freeze Dehydrated Foods

Leading off the Scientific Advisory Council meeting in the Carlton Room, Sheraton Carlton Hotel, was a general discussion on freeze dehydrated foods. Council members participating in this discussion were Drs. Bernard E. Proctor, chairman, Food Technology Department, MIT; Donald K. Tressler, consulting scientist, Westport, Connecticut; Carl H. Koonz, associate director of research, Swift & Co., Chicago, and Harold W. Schultz, chairman, Food Technology Department, Oregon State College.

Dr. Proctor opened the round table discussion with a statement of the standards to be met in order for a product to qualify as a food; such as looks, taste and otherwise meeting the satisfaction of the senses. He described some work accomplished by the British Food Ministry and emphasized the compactness and economy of freeze dehydrated foods.

Tressler differentiated between the terms, *freeze dehydrated* and *dehydro-frozen*. He also distinguished between *puff drying and* other methods. He characterized puff drying as a cross between dehydro-freezing and freeze drying, and pointed out the fact that a commercial product of orange crystals is being marketed as a result of this development. He reported on the possibility of tomato juice being the next product in commercial production.

Tressler also covered the weight advantages and pointed out the practicability of freeze drying for military rations. Some production types of equipment were described by this scientist. It was learned in this discussion that the U. S. Armed Forces through the Quartermaster Food & Container Institute has developed up to 20 one-dish meals such as chicken and rice, chili con carne, meat and noodles, etc., all prepared, freeze dehydrated and stored successfully for re-hydration and quick serving.

Another Convenience Food

Dr. Koonz answered the question on where freeze drying fitted into the scheme of food preservation methods. He showed considerable enthusiasm for freeze drying, pointing out that it is another consumer convenience food certain to be popular with the housewife and holding promise of substantial food preparation savings for institutions. He visualized it as a commercial certainty.

Dr. Schultz described the various changes which affect food; i.e., bacterial, chemical and physical. He then pointed out that freeze drying reduces the water content in foods which, of course, has a direct bearing on the three changes that can take place. He described briefly this form of research on green beans at the Oregon State College.

Other members on the Scientific Advisory Council participating in the freeze dehydrated food discussion were Dean Prescott, Professor Carl F. Kayan, Dr. J. G. Woodroof, Dr. Michael J. Copley, Dr. William H. Cook, Dr. George F. Stewart, Dr. E. A. Fieger and Joseph W. Slavin.

Cost Factors Emphasized

Industry members Bill Baker and James Kuehn directed a number of questions to the Advisory Council. Answers brought out: costs for freeze drying of foods range from three to 10 cents per pound as compared with

Continued on Page 40

M. W. Young

F. D. Newell, Jr.

Dr. W. A. Maclinn

W. C. Baker

A. R. Carstensen

J. W. Straub

Warehousemen Weigh --

LOCAL DELIVERY SERVICE FROZEN FOOD DISTRIBUTION

Capitol Meeting Affords Congressional Visits

▶▶▶ TRUCK TRANSPORTATION and Frozen Food Distribution, were the opening and closing topics of the NARW Annual Industry Convention Business Program. They were probably the most timely and important of the topics presented. Although all subjects on the 4-day agenda had quite significant importance, trucking and distribution are current economic problems of the cold storage and allied food distribution industries.

The National Association of Refrigerated Warehousemen Association met concurrently with the Merchandising Division in Washington, D. C., April 6 to 9 at the Statler Hilton Hotel. Those meetings followed The Refrigeration Research Foundation meetings on April 2 to 4.

Concurrent Meetings

The AWA and its two divisions opened the annual meeting with a general luncheon at 12:15 on Monday, April 6. At 3:00 p.m. NARW opened its general business sessions with reports of the president and treasurer, and summaries of the 1960 committee programs by the various chairmen. There were summaries from the chapter chairmen on business outlooks in their regions and a report by the nominating committee.

Exec. Vice Pres. Introduced

Introduced at the NARW general business sessions was Richard M. Powell, executive vice-president, selected by the Association's executive committee in August to succeed Bill Dalton who resigned to enter another field. This was Powell's first meeting with the general membership of NARW since his appointment. He assumed his duties with the refrigerated division of AWA on October 1.

Congressional Visit

Second day of the meeting was reserved for a visit to Congress. Warehousemen had an opportunity to visit the House and Senate which generally convene at noon. Most of the industry visitors to the nation's capitol paid a call on their representatives and senators in the time provided earlier that morning.

However this visit to Congress didn't bring the curtain down on Capitol Hill contracts. On Wednesday, April 8, at 10:30 a.m. NARW's President, Philip Kuehn, moderated a legislative session. Congressional leaders spoke on subjects of taxation and labor at this session.

The Legislative program included the Hon. William A. Ayres, (R), Ohio, Member, House Committee on Education and Labor, who spoke on "Labor-Management Relations"; Hon. Hale Boggs (D), La., Member, House Ways and Means Committee, speaker on "Taxes", and Hon. John W. Byrnes (R), Wis., Member, House Ways and Means Committee, speaking on "General Legislative Trends".

Other Tuesday Sessions

Two panel sessions were presented on Tuesday afternoon, one on refrigerated warehousing and truck transportation, and the other on meeting plant modernization problems. Moderator of the truck transportation session was K. F. Stepleton, Continental Freezers of Illinois. He opened with the topic "Maintenance of Product Temperature". Other panelists were John Keefe, Cumberland Warehouse. Seabrook, New Jersey, Harold Neiman, Merrifield Trucking, Los Angeles and Harold L. Rubenstein, V. P., Emory Transportation Co. Chicago, on the topics of "Shipper-Warehouseman Relationship Through Trucker", "Future Of Refrigerated Trucking-Equipment and Service", and "The Trucker's Reaction to More Rigid Policing", respectively.

Engineering, Construction, Handling Methods Panel

Ralph Mackenzie, U. S. Cold Storage, Chicago, was moderator of the Plant Modernization Session. Alex MacTaggart, Lackawanna Cold Storage, Scranton, C. M. Smith, Merchants Ice & Cold Storage, San Antonio, and Paul A. Vollmer, Produce Terminal Cold Storage, Chicago, were the other panelists.

... more ▶

G. J. Stecker

P. G. Kuehn

R. M. Powell

AWA Officers, 1959-60

C. J. LaMothe, Gen'l. Pres., St. Louis
Phil G. Kuehn, Gen'l. V.P., Milwaukee
W. A. Morse, Gen'l. Treas., Minneapolis
Donald E. Horton, Gen'l. Secy., Chicago

NARW Officers, 1959-60

W. C. Baker, Pres., Chicago
A. R. Carstensen, V.P., Sacramento
J. W. Straub, Treas., New York
R. M. Powell, Exec. V.P., D. C.
J. H. Colquitt, Secy., D. C.

NARW Exec. Committee

President, Vice Pres., Treasurer
C. A. Bowen, Jr., Nashville
R. T. Mackenzie, Chicago
W. Irving Moss, Jr., Kansas City
G. A. Shoemaker, Elmira
L. L. Urban, Los Angeles
A. W. Oakley, Jersey City
W. L. Baker, San Francisco
W. B. Haggerty, Tampa
V. C. Stevens, Dallas

Since the panel was an economic-minded one, the moderator and first speaker, of Scotch descent, Ralph MacKenzie, promptly renamed the other two panelists and introduced them following MacTaggart, as MacSmith and MacVollmer. Economic minded Scotch engineers, Mackenzie explained, had a reputation which he felt the panel upheld.

Topics were, Automation and its Resultant Labor Headaches, by MacTaggart; Modernizing a Multi-story Building, by Smith; and, Meeting Plant Modernization Trends, by Vollmer. MacTaggart related his experience in converting an 80-ton ammonia absorption plant to 100-TR, by 2-staged automatic system, with a resultant reduction in labor force of from 17 to 3 engineers. Smith's presentation dealt with the modernization of a multi-story warehouse using the "lift-slab" method. Vollmer's presentation dealt with commodity and materials handling within the warehouse.

Service and Research

Preceding the legislative session on Wednesday, F. D. "Duke" Newell, Minneapolis Cold Storage, was moderator of a panel on "What Our Services Really Cost Us". Henry Lloyd, Merchants' Refrigerating Company, NYC, W. E. "Bill" Ready, Indiana Terminal & Refrigerating, Indianapolis, C. B. Taylor, C. B. Taylor & Associates, Toronto, and Horace Wilson, Quaker City Cold Storage, Philadelphia, completed the panel on service costs. Their topics respectively were "How We Find Out In California", "Office Costs", "How To Solve Your Problems Through Ratio Studies" and "Cost Of Small Deliveries".

Following the legislative session there occurred a closed session at which Paul Gerhardt, Midwest Research Institute, Kansas City, made a report on the Economic Research Study". A precedent was established with this session as admission was by ticket only and limited to those firms which contributed financially to the project. For the benefit of those firms which did not attend the closed meeting on economic research, NARW scheduled one of its popular workshop sessions.

Futures

Thursday's session, with exception of one talk and one panel presentation, was devoted to a certain amount of "futurizing". Among the topics slated were the "Effect of Research on the Future of Refrigerated Warehousing", "A Look Ahead at the Refrigeration of Food" and "Should Public Refrigerated Warehousemen Distribute Frozen Foods?".

Dr. Walter Maclinn moderated the panel discussion on the Effect of Research. He is Director, TRRF, Colorado Springs. On the panel with him was Welker G. Bechtel, Director of Laboratories, American Institute of Baking, whose subject was "Future of Frozen Bakery Products".

Frozen Food Code

Also on the panel with Dr. Maclinn and Garnatz was H. P. Schmitt, Research Director, National Association of Frozen Food Packers, who introduced the "Proposed Frozen Food Handling Code." Sidney Schwartz, National Frozen Food Processors Association, also a panelist, spoke on "The Future of Prepared Frozen Foods". W. T. Pentzer, chief, Biological Services Branch, Marketing Research Division, USDA, concluded the a.m. sessions with "A Look Ahead at the Refrigeration of Food".

Moderator on the panel on the Distribution of Frozen Foods was W. B. Haggerty, Tampa Cold Storage & Warehouse. Other panelists were C. A. Martin, Jr., Polar Refrigerated Services, Nashville; J. W. Straub, Merchants Refrigerating Co., NYC., and L. L. Baker, National Ice & Cold Storage, San Francisco.

Opening Thursday a.m. sessions featured Jim Kuehn, Wisconsin Cold Storage, Milwaukee, on "The Case For A Standard Notice of Delivery Form". Afternoon sessions also featured a panel of NARW Committees on Government Affairs, Insurance, Safety, Industrial Relations, Warehouse Oper'ns, Costs, Policies.

NARW–1959 Directory

▶▶ FREE DISTRIBUTION has been made of the 1959 Directory of Public Refrigerated Warehouses, which lists facilities of the National Association of Refrigerated Warehouses membership. Over 6,000 users of public refrigerated warehouse space received this industry "Who's Who" in January. Free copies are available to qualified firms from NARW headquarters in the District of Columbia.

In addition to the directory features, the publication contains a message to refrigerated warehouse space users from Richard M. Powell, Executive Vice-president, NARW; a statement of the objectives of NARW; a list of the officers, executive committee and honorary members; a page outlining the objectives of The Refrigeration Research Foundation; a Buyers Directory; Listing of Regional Chapters and a Directory of major Canadian and foreign warehouses. (Under Book Reviews, this issue of INDUSTRIAL REFRIGERATION, there is a description of the English Warehouse Directory.)

Copenhagen Prepares For Int'n'l Refrigeration Meet

▶▶ TENTH International Congress of Refrigeration will meet in Copenhagen, Denmark, August 19-26, 1959. It is expected that 1500 visitors will attend the meeting.

The meetings will be held in the Technical University of Denmark. The program, while not finalized, provides for a full week of discussions by world refrigeration authorities.

AVI Publishing Co. Gets Editorial Board

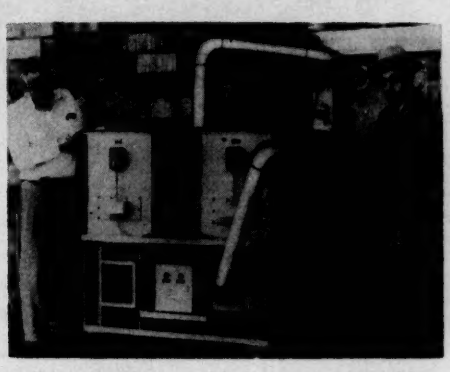
▶▶ ADVISORY in scope, an editorial board has been organized for AVI Publishing Company, Westport, Conn., by Donald K. Tressler, manager and editor. To advise the publisher concerning scientific fields in which books are needed by the food technologist, chemist and bacteriologist, the board will also aid the publisher by suggesting topic authors.

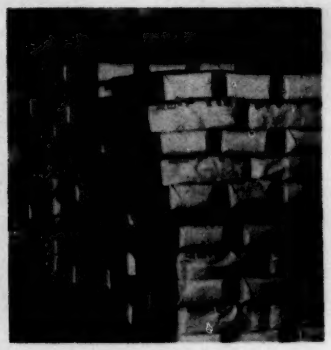
Dr. John H. Nair, consultant and formerly assistant research director of Thos. Lipton Co., Summit, New Jersey, is the board chairman. The board will meet May 20 in Philadelphia. Others on the AVI Advisory Board are: Drs. M. J. Copley, WURL, USDA, Albany Cal.; Wm. B. Esselen, Food Tech. Dept., U. of Mass., Amherst; Reid Milner, Food Tech. Dept., U. of Ill., Urbana; Harvey Murer, General Foods Corp., Tarrytown, N. Y.; Carl S. Pederson, Food Tech. Dept., NYS Exper. Sta., Cornell U. Geneva; Bernard E. Proctor, Food Tech. Dept., MIT, Cambridge; Harold Schultz, Food Tech. Dept., OSU, Corvallis; Bernard Schweigert, AMI, Chicago; George Stewart, Food Tech. Dept., U. of C, Davis, Cal.; K. G. Weckel, Food & Dairy Science Dept., U. of Wis., Madison, and P. A. Wells, EURL, USDA, Phila.

In-Transit Service By Boise Cold Storage

▶▶ USED PRINCIPALLY by processors and distributors, the 10,000 sq. ft. addition at the Boise Cold Storage Co. will hold the equivalent of 80 carloads or 1600 tons. Total capacity of the plant with the new concrete block building is 3,000 tons. Temperatures range to minus 5 F for storage, according to the Idaho Power Company Bulletin which stated that the new addition increased the plant's electric use by about 40 percent. The addition was completed last Fall and all types of food grown in the Valley or shipped in from other points are stored in the building. Typical of the in-transit service was a short-term storage of 500 tons of dried milk.

Control Humidity at One Cent per Cubic Foot





Products pictured left and right in this illustration bring added revenues to public refrigerated warehouses which convert idle coolers to humidity controlled cool stores. Unit pictured in the center maintains 50 percent r.h. at 34 F for the storage of dry milk products, Government rations and similar goods in this 100,000 cu. ft. room at Holley Cold Storage Co.

Dehumidified Storages From Cooler Rooms Are Practical Money Makers

By ANTHONY HASS

▶▶▶COLD STORAGE ROOMS, once the mainstay of the refrigerated warehouse industry, have become not only something of a drug on the market, but also a definite drag on the profits of many warehouse operators.

It's all a part of the ever increasing trend toward immediate marketing or quick freezing of the food stuffs that formerly flowed into cooler space where low temperatures and high humidity reduced shrinkage, preserved flavor and retarded spoilage in products awaiting a trip to the corner grocery store.

Temperature Demands Change

Not more than 30 years ago, "wet and cold" storage accounted for about 80 per cent of all refrigerated warehouse space with a mere 20 per cent accorded to freezer operation. Today the percentages are completely reversed with a demand for "cold and dry" storage cutting even further into the use of cooler facilities.

To the layman, the obvious way to beat the reversing percentages would seem to be conversion of unwanted cooler space to freezer chambers. On the surface, this seems a wise suggestion, but careful investigation by warehouse operators has shown that such conversions are not readily accomplished. Overlooking the myriad of individual problems involved in such alterations, one finds at the heart of the matter the simple fact that the insulation and refrigeration requirements for efficient conversion to freezer space is costly.

Such an expense cannot be justified when the space can be more easily and profitable altered for low humidity storage.

A survey of items available for low humidity storage serves to show the wise warehouseman that conversion to a "cold and dry" operation is indeed worth the time, money and effort. One of the top buyers of this sort of space is Uncle Sam who annually allots an impressive number of contracts for long-term storage of various government rations. Equally lucrative is the market for storage of candy, cheese, chocolate, popcorn, potato chips, flour, sugar, etc.

Humidity Control Pays

While the controlled temperatures of cold storage rooms are ideal for these commodities, they are all highly susceptible to moisture damage and, therefore, must be stored in areas where the humidity can be accurately controlled. Government rations, for example, require a relative humidity of between 45 and 55% and an average temperature of 33° while candies must be stored in an even balance of 50% relative humidity and 50° temperature. Thus, in order to crack the vast market for "cold and dry" storage the operator is faced with the problem of "dry conditioning" space originally designed for high humidity storage.

In planning the most economical and practical method of making such conversions today, warehousemen may profit greatly from the experience of fellow tradesmen who are now operating low-humidity storage areas. The most frequently repeated advice is that no consideration be given to methods of humidity control until steps have been taken to dry out the walls and provide a barrier against additional moisture penetration.

Dry Out and Vapor Seal

Cooler walls were built to hold humidity at high levels and are not generally isolated well enough against moisture penetration from the outside. Moreover, many warehouses with insulated walls, floors and ceilings contain tons of entrapped ice which will continue to melt or evaporate and keep humidity high within the storage chamber.

Until these problems are corrected, the use of chemicals or dehumidification equipment is useless.

Moisture migrates instantly from areas of high to low humidity. A dehumidifier, which creates an area of low vapor pressure will actually draw water from areas of high moisture content—from insulation, walls, ceilings, floors or even from an adjacent room—thus pulling moisture into the dehumidified space without materially reducing the humidity in the area. It is therefore vitally important to start conversion with dry walls and an effective vapor barrier.. . **more ▶**

The Author, Anthony Hass, is president of Dryomatic Corp., Alexandria, Virginia. His company is an associate member, National Association of Refrigerated Warehouses, Inc.

The first step is, of course, to deal with the accumulation of ice and moisture in the walls. The refrigeration in the area should be turned off and the water from the melting ice should be collected and dried up. This process can be speeded by blowing hot air over the walls.

Effective Vapor Barriers

Applying an effective vapor barrier to well dried walls becomes a fairly simple and relatively inexpensive process. If at all possible, such a barrier is best installed on the outside of the refrigerated space so that the insulation will also remain protected.

After the walls have been fully covered, doors should be made moisture proof with rubber gaskets. All openings around pipes or ducts should be carefully sealed to make the chamber as tight as possible. Careful sealing of the room not only assures accurate humidity control, but also makes for a less expensive operation.

Moisture Removing Methods

Calcium chloride, a chemical that has the property of extracting moisture from the air that circulates over it, has been used for moisture control in storage rooms. In common practice, the chemical is placed in trays held in racks and fans are used to blow air over the solution. Moisture thus extracted is allowed to drip into a container under the racks.

This system has many obvious disadvantages. Not only does the calcium chloride require frequent replacement, but there is the added labor cost of refilling the chemical pans and emptying the water container. In a typical case, where humidity had to be controlled in three medium sized rooms, the cost of the calcium chloride was running at the rate of $40.00 per week in addition to the expense of $45.00 for the part time services of a maintenance man to tend the racks. All of this effort, at a cost of nearly $5,000 per year, only reduced the humidity from 98% to about 90%.

For cheaper and more efficient operation, warehousemen are now turning to automatic dehumidifying machines using silica gel rather than calcium chloride as the drying agent. These machines draw moist air from the room over a permanent bed of silica gel, returning dried air to the area. As soon as the drying agent becomes saturated, it is automatically regenerated by an embedded electrical heating element which vaporizes the adsorbed moisture and exhausts it outside the space through an easily installed duct. This drying and regeneration of the silica gel gives the desiccant an almost indefinite life.

Typical Mechanical Unit

Automatic desiccant type dehumidifiers are available in a number of sizes, some of them designed specifically for operation at 31 to 33F. A typical machine costs under $2,000 installed and is capable of maintaining humidities as low as 40% in up to 100,000 cu. ft. of space.

Under constant operation it draws 80 Kwh day, which, at an average power cost of 2c Kwh, amounts to $1.60 a day or approximately $600 per year. At a conservative five-year write-off for the dehumidifier, the entire installation, operation and depreciation of equipment should cost less than $1,000 a year. This type of equipment can thus maintain much lower humidity levels at a fraction of cost of the corrosive salt method.

Practical Pull-downs

Whether chemicals or a modern machine are used, the initial "pull down" period in a newly converted area may be quite long. When the space has to be rapidly dried down to receive a load of moisture-sensitive product on short notice, some additional help may be necessary. According to one experienced warehouseman, the "trick" of quick dehumidification in controlled areas is to put a little "expansion" on the refrigeration coils, thus condensing out some of the excess moisture in the chamber. This, of course, should be done at such temperatures that the coils will barely frost and most of the condensate will drip into the collecting pans in liquid form.

It must also be noted that empty space is much more difficult to maintain at very low humidities. Once the load is stored, the amount of air space is reduced and the task of the dehumidifying equipment becomes an easier one. Paperboard cartons and wood crates will also act as a flywheel in counteracting rapid changes in the humidity which may occur due to opening of doors and other sudden moisture loads.

Once the space has been engineered for proper dry conditioning, the operator may open his doors to commercial or government prospects who will qualify him to bid for "dry-cold" storage.

Humidity Controlled Storage Prospects

The United States Army Quartermaster Corps currently keeps stored some 14,000,000 rations as part of its "mobilization reserve". In other words, these rations could feed 1,000,000 men three times daily for 14 days if immediate mobilization should become necessary.

Basically, all the rations contain cans and packages, usually unlabeled, with their contents stamped on them. The QMC found that the shelf life of these rations in standard moist refrigeration was about three years due to the hazards of can corrosion and alteration of the quality of the dry foods. This meant that each year one-third of the stored rations were removed and fed to troops in regular messes and an equal amount of fresh rations went into storage.

Shelf Life Increased

In dehumidified storage the Army found shelf life increased to five years, hence only one-fifth are drawn annually and replaced with fresh supplies. Gross savings of about $2,000,000 are estimated by the Army annually from dehumidified storage which, even after the Army's bill of about $1,500,000 for dry storage, leaves a net saving of $500,000.

In order to qualify for a share of this $1,500,000 storage business, the operator should visit his Regional Quartermaster Corps and arrange to be qualified as an approved bidder for the storage program.

Under the dairy price support program, the government also stores quantities of cheddar cheese which is placed in "cold and dry" storage awaiting use in government supported projects such as the school lunch program. While the demand for cheese storage space is confined largely to the east and mid-west, it is an excellent source of revenue for warehousemen in these areas who obtain government certification of their dehumidified storage areas. Full information on this program may be obtained by writing to the Commodity Stabilization Service, Cincinnati, Ohio.

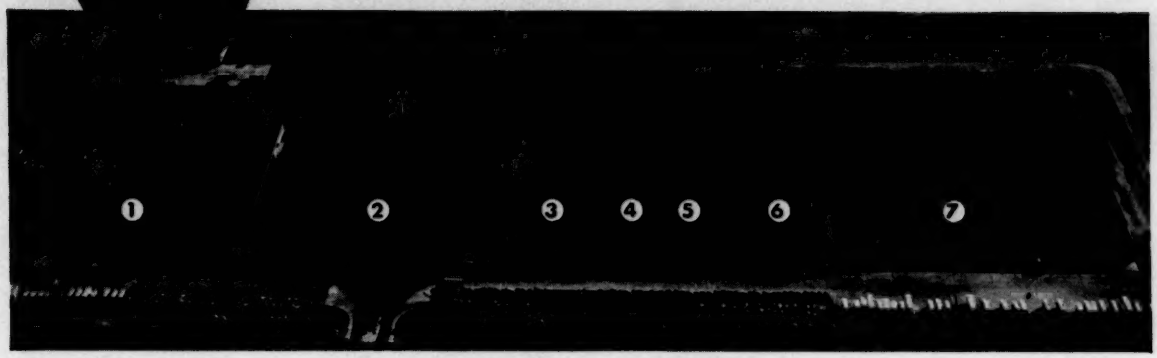
Best Storage Prospects Yet To Be Cultivated

Excellent markets may also be opened by writing directly to manufacturers of such moisture-sensitive products as condensed milk, candy and chocolate. Manufacturers of candy, for example, purchase dehumidified storage in warehouses in all parts of the country. Stocks of candies are shipped directly to these warehouses and held there until needed by various dealers and jobbers in the immediate area.

These are but a few of the sources of profitable business opened by warehousemen who have made the conversion from "cold and wet" to "cold and dry" storage. It's an investment that can be made for under $1,000 a year for 100,000 cu. ft., but one that pays off handsomely during every season of the year.

Look Inside

this huge Safeway warehouse...



1. Meat 2. Produce 3. Mixed Loads 4. Baked Goods 5. Frozen Foods 6. Milk Products 7. Groceries

Discover How 4½ Acres of Food Are Quality Protected by YORK Refrigeration

York V/W Compressors, as installed here at Safeway, are adaptable either as booster or high stage machines. York's built in capacity reduction feature gears power loads almost directly to product loads. At 25% product load, for example, the compressor requires only 28% power. And for low maintenance—every part subject to wear can be replaced easily with ordinary hand tools.

For assured performance and protection, the Safeway Stores Warehouse in Denver really put its faith in York Refrigeration Equipment. Here—in a warehouse 1790 feet long with 13½ acres of floor area—York equipment delivers over 528 tons of capacity for the 200,000 square feet under refrigeration.

In the seven refrigerated product sections, eighteen York V/W type compressors produce temperatures ranging from minus 20° F to plus 52° F. The compressors contain a total of 120 cylinders and are operated by motors having a combined capacity of 900 horse power.

Over 50 York Air Conditioners of varying types are used in the various sections for proper distribution and maintenance of temperatures. Other York equipment includes condensers, receivers, oil separators, inter-coolers, suction traps, water cooling towers, etc.

For proof of flexibility—a recent situation called for one room at 67° F. for bananas, three other rooms at 42-46° F., and the remaining four at design conditions.

For more information about flexible, dependable, York V/W compressors and their application to a wide variety of refrigeration needs, write the York Corporation, York, Pennsylvania.

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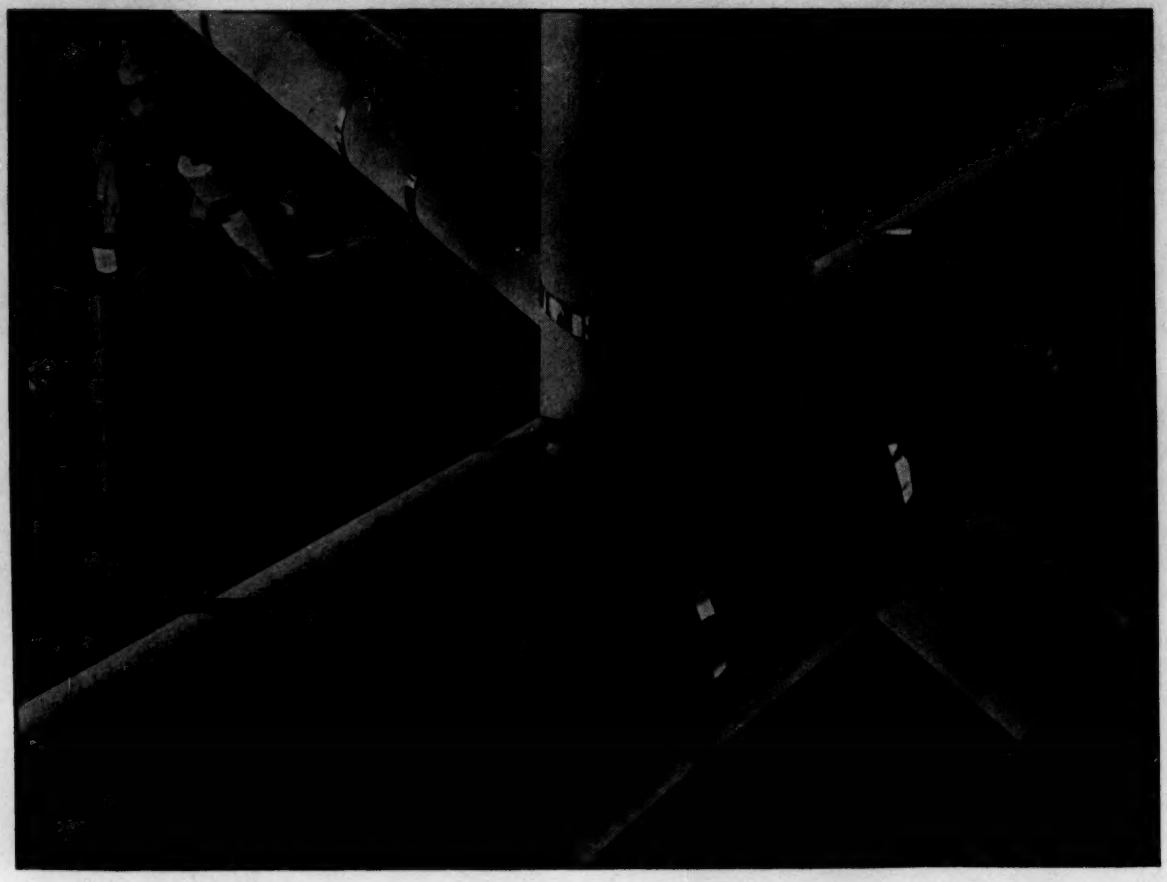


STYROFOAM® *stops moisture, repels heat*

Superior properties make Styrofoam outstanding for low-temperature pipe covering.

There are just three things most people ask of a low-temperature pipe insulation. That it . . .

(1) stop costly heat gain, (2) prevent condensation and dripping, (3) stay trim and effective without maintenance.

Pipe covering made of Styrofoam* does an outstanding job all three ways, and at surprisingly low applied cost. The reasons are: Styrofoam has a low "K" factor that stays low permanently because of this insulation's unyielding resistance to water vapor. (This is the same Styrofoam that has been so widely used as a low-temperature room insulation by leading companies everywhere during the last 10 years.)

Styrofoam is effective as a vapor seal, and will not crack or split in extremely cold or rapidly changing temperatures. It is not subject to ice build-up around valves. And Styrofoam is lightweight, easy and economical to apply. Coatings for both indoor and outdoor use are available and are easily applied in the field.

The companies listed below manufacture a complete line of pipe covering made from Styrofoam, as well as a wide variety of equipment and tank insulating segments. See them about your low-temperature pipe covering problems. Or write to Plastics Sales Dept. 2223BU5.

*STYROFOAM is Dow's registered trademark for its expanded polystyrene

Manufacturers

Fastab Insulation, Inc., 304 Cleveland Transit Building, Cleveland 14, Ohio • Fibrous Glass Products, Inc., Alpa Plaza, Hicksville, L. I., New York • Gle-Brite Products, Incorporated, 6415 North California Avenue, Chicago, Illinois • Kennedy Industries, 4447 Alger Street, Los Angeles, California • Kransco Manufacturing Company, 503 Railroad Ave., South San Francisco, California • MMM, Incorporated, P. O. Box 968, Portsmouth, Ohio • Robinson Industries, 3051 Curtice Road, Coleman, Michigan • Styro Fabricators, 1401 Fairfax Trafficway, Kansas City, Kansas • Styroformics, Inc., 17 Hawkins Street, Somerville, Mass. • Tuffilte, Inc., Ballston Spa, New York

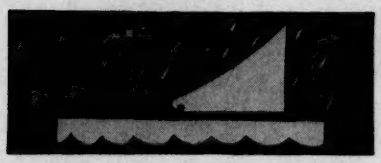
THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN

Experience proves

STYROFOAM

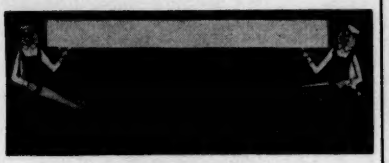
has the best combination of insulation properties

SUPERIOR INSULATION
Permanent low "K" factor



OUTSTANDING WATER RESISTANCE
Stays dry and effective

HIGH COMPRESSIVE STRENGTH
3000 pounds per square foot



EASY TO HANDLE
Lightweight, can be cut with ordinary tools

RESISTS ROT
will not attract vermin

ECONOMICAL
low in-place cost, low cost-per-year service

DOW

Book Reviews

English Warehouse Annual Includes Useful Papers

Yearbook, 1959 $1.50

NATIONAL FEDERATION OF COLD STORAGE & ICE TRADES

▶▶▶ COMPARABLE publication to the DIRECTORY OF PUBLIC REFRIGERATED WAREHOUSES, published in the United States by the National Association of Refrigerated Warehouses, is the 1959 YEARBOOK OF THE NATIONAL FEDERATION OF COLD STORAGE & ICE TRADES, London. Just as the American publication lists their membership in a geographical arrangement for the service and convenience of refrigerated warehouse users, the English version provides a somewhat smaller but quite similar geographical listing. However, the organization in London also lists affiliate associations and their members in other countries of the United Kingdom.

Approximating the same size as the NARW publication, the British cousin has a hard cloth cover and incorporates several other useful features. Preceding the geographical directory are condensed reprints of papers given in 1958 before the International Institute of Refrigeration and the National Association of Poultry Packers. Specific titles of the papers are: "Rapid Cooling Of Meat In Germany" by Professor Dr. J. Kuprianoff; "Modern Trends in Cold Storage Design and Operation In France" by P. Vidal; and "Refrigeration In The Poultry Industry" by Dr. J. Brooks.

Storage Temperatures, Relative Humidities, and Related Data of various commodities follow the affiliated warehouse listings, including Temperatures and Atmospheres Recommended for Refrigerated Gas Storage of Apples and Pears. Several pages are devoted to common engineering terms which management would find useful, and there is a listing of current books on refrigeration which appears to be very practical. To be sure to keep the publication on the user executive's desk, is a calendar bound into the edition.

Underwriter Publication Cites Motor Failures

▶▶ MOISTURE is the primary enemy of electric motor insulation as many refrigerating plant engineers are well aware. However, production and supervisory personnel in many an enterprise where electric motors are critical to continued operation, are unaware or careless of the fact that moisture may put them out of work. First quarter, 1959 of THE LOCOMOTIVE, a publication of The Hartford Steam Boiler Inspection and Insurance Company, devotes eight pages to a report on the analysis of causes of insulation failures in all types of electrical equipment over several years.

Repair costs resulting from the failures were minor compared with the production losses. Failures were preventable and could be placed in one of two main categories; lack of good maintenance, or carelessness. Although 28 percent of the failures occurred in paper mills, such concerns as breweries, dairies, meat packing plant, chemical plants, hotel and office buildings were not far behind. Meat packing plants placed second in the number of failures. Chemical plants, dairies, hotels and office buildings were next in stated order. Dairies and canneries present somewhat the same problem as do meat packing plants, the failures being due chiefly to accidents that occur during wash-up.

Offers Check-Off List

Over 40 percent of the failures fell into one of the three categories; condensation, careless wash-up practice, and pump packing troubles. The article presented a 20-point checkoff list in which causes were listed in the order of their frequency. Personnel in both plant and production departments would find this checkoff list useful in preventing failures of electrical motors.

In the same issue of THE LOCOMOTIVE there is pictured and described an accident that took place in a cooling tower. A rigid type coupling in the drive line broke and allowed the shaft to whip upward and strike the rotating blades of the tower fan. The two blades broke off at the hub and another 18 inches from the tip. The cooling tower was damaged by the flying pieces. No personnel casualties were reported.

New Standard Available On Refrigeration Nomenclature

ASA Standard B.53.1–1958 $1.25
REFRIGERATION TERMS & DEFINITIONS
ASHRAE, 234 Fifth Ave., N. Y. 1, N. Y.

▶▶ REFRIGERATION terms and definitions, American Standard B53.1-1958, has been approved by the American Standard Association and published by the American Society of Refrigerating Engineers. ASA indicated in the release which announced this work, that it is hoped the Standard will bring about more logical and consistent use of terminology; serve as an authority on word meaning in specifications and other writing; provide a means of comparison for closely related words; be a vocabulary source for technical writing; and, provide a classification system. The Standard contains an index of classifications, an alphabetical index and a classified list of words and definitions.

Available at $1.25 each from ASHRAE, the Standard was developed by ASA Sectional Committee B53, in which the following organizations were represented: ARI, ASHAE, ASME, National Ice Association, NAPRE, NARW, NBS, NEMA, RACCA, TRRF, RSES, others.

NAPRE QUESTION BOX

H. P. Hayes

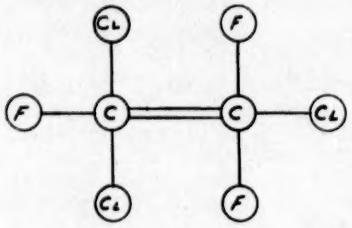
HAVE A QUESTION? Address it to Prof. Harold P. Hayes, Dean of Engineering, State Polytechnic College, San Luis Obispo, Calif. Answers appear monthly in this department on problems forwarded by NAPRE members. Comments from all readers welcomed.

Designating Refrigerants By Chemical Formulae

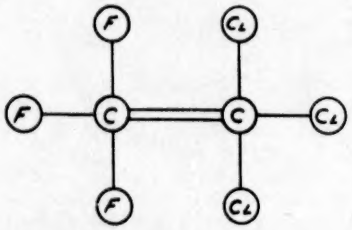
QUESTION: Our refrigerating system uses Refrigerant 113. In the compressor manual it is described as trichlorotrifluorethane (CCl_2F-$CClF_2$). Guy King's Table 9 in his paper "New Refrigerants", 1957 NAPRE OPERATING DATA BOOK, shows the same gas to have a chemical formula of $C_2Cl_3F_3$. I presume either way to write it is correct but I would like to know why one author expresses the formula one way, and another author a longer more complicated expression.—R.L.F., Chicago.

ANSWER: The formula $C_2Cl_3F_3$ shows that Refrigerant 113 is a compound composed of two atoms of carbon, three atoms of chlorine and three atoms of fluorine. Nothing is said about how the atoms are supposedly attached to each other.

The other formula CCl_2F-$CClF_2$ tells the chemist that the atoms are grouped like this



If the formula had read CF_3-CCl_3 the atoms would be grouped like this



Then, the CF_3-CCl_3 would probably have different chemical properties than its cousin CCl_2F-$CClF_2$.

The chemical formula $C_2l_3F_3$ describes either of the above chemicals. It does not describe the structure. It tells only part of the story.

—R.G.R., Cal Poly.

Operating Troubles With Compressor Valves

QUESTION: During the past season we had more valve troubles than in any previous year. We are using the compressor manufacturer's own valves in compressors and boosters.

The boosters were equipped with ring plate valves when new. Approximately five years ago we removed the poppet type suction valve from the high-stage compressors and installed a new valve by the machine manufacturer, which is a ring plate assembly. The discharge valves were originally the ring plate type.

At first we had trouble with the center rivet breaking, but now the manufacturer has overcome that problem. According to them, it had something to do with improper temper of the rivets. Now our trouble seems to be with sudden changes in gas temperature, resulting in broken plates.—C.S. and R.V.P., Pa.

ANSWER: Recurring compressor valve troubles are not limited to one or two makes. Even with the description provided, there could only be a few guesses ventured as to the cause. However, the last paragraph of the question gives some indication of why trouble is experienced.

Manufacturers deliver the best quality and workmanship into their machines. They have to, to stay in business. However, many an installation has failed to protect the compressor against such abuse as sudden changes in gas temperature, slugs.

The manufacturer of your valves has apparently detected a weakness in its design or in the material used, and corrected the condition. However, your system should be carefully analyzed as to why it has sudden changes in gas temperature, and a proper suction trap or inter-cooler provided to correct this condition.

The why's and wherefore's of certain valve construction may prove to be an interesting panel for a future NAPRE convention. For example, several manufacturers build their valves of several thin laminated ring-like plates of spring steel, riveted together as the questioner mentions. Still a couple of others use only a single flat ring plate. Another uses a ball construction seating in a number of modified inverted cone openings.

Of course, any such panel on the "why" of various designs and operating characteristics can only be complete if it is followed by a talk or another panel on compressor protection methods. —R.L.F., Chgo.

Refrigerant Data Sources

QUESTION: Where can we obtain a booklet or brochure on Refrigerant 13? The literature provided with the environmental plant described in a previous question had little data supplied other than a pressure-enthalpy table. —A.E.C., Los Angeles.

ANSWER: For information on Refrigerant 13, refer to page 32-35 and 32-38 of the ASRE DESIGN DATA BOOK, 1957-58; Chart 3, page 32-34 —Pressure Enthalpy Diagram; Table No. 5—Properties of Liquid and Saturated Vapor, R-13; Table No. 6—Properties of Superheated Vapor, R-13. You may also be interested in Chapter 7, page 7-10, entitled "Refrigerants" which discusses Thermodynamics, Physical and Chemical Properties of Refrigerants. In the event the reference information above does not meet your needs, write to:

Gen. Chem. Div.
Allied Chemical Co.
40 Rector St.
New York 6, N.Y.

ASHRAE
234 Fifth Avenue
New York 1, N.Y.

Union Carbide & Chemicals Co.
30 E. 42nd St.
New York 17, N.Y.

Pennsalt Chemicals Corp.
3 Penn Center,
Philadelphia 2, Pa.

E.I. du Pont de Nemours & Co.
Kinetic Chemical Division
Wilmington 98, Delaware.

—J.M.M., Cal Poly.

Holding Humidity With Indirect Refrigeration

QUESTION: One carload of ice which G.S.A. in his question on "Material Heats" in the September issue, wasted, could have been used very readily by this writer not too long ago. Contrary to usual practice, we were required to store a product at less than 50 RH, at a temperature of 36 to 38 F. Like G.S.A., I had some obsolete buildings only I was more fortunate in the fact that they were cooler storage rooms. I also had some old brine pipe coils but no more refrigerating plant. I didn't overcome my humidity problem, the merchandise in cans rusted, and we took a loss of more than product.

I have often thought of what I would do again in such an event, using a portable pump and a water ice refrigerant. Would someone care to check me by outlining steps to be taken, to accomplish the RH and temperature requirements if the room size is given, number of lineal feet and size of pipe, and the horsepower or gpm of the pump? The product was precooled when it was delivered and we were to hold it at these conditions in the field.

J.A.H., Los Angeles.

ANSWER NO. 1: The answer to this job involves a lot more information than given in the inquiry and would proably best be solved by installing modern refrigeration units in place of the old brine type coils. It might even require some reheat.

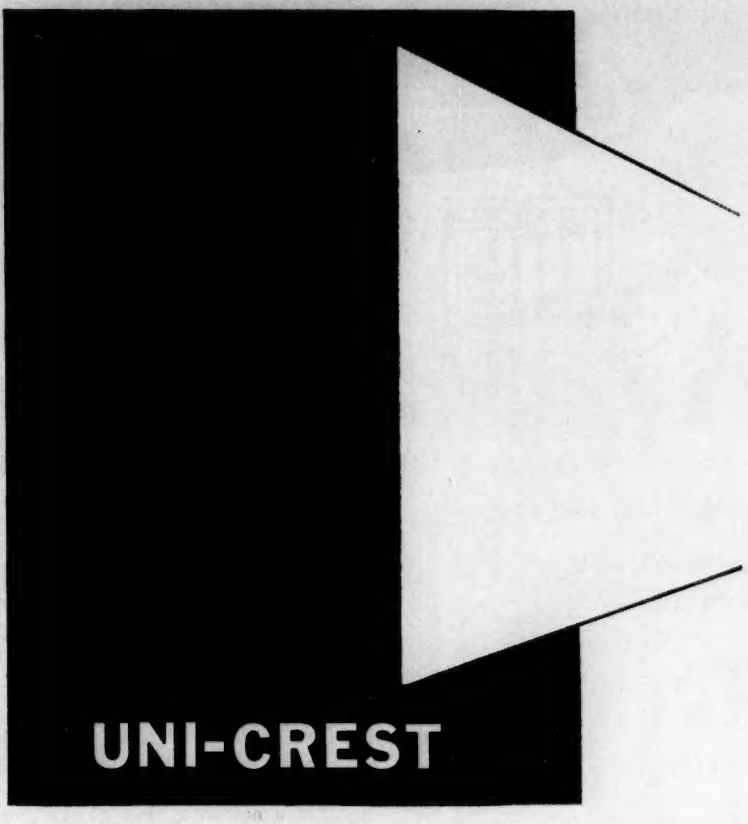
–D.D.W., Los Angeles.

ANSWER No. 2: Circulating ice water at 32 to 34 F from a melting tank through coils placed in a ventilating system for a church or auditorium will help reduce temperature and condense out some moisture. Combined with the evaporative effect of the moving air, it provides a measure of human comfort for short term conditioning.

However, it is a mighty risky business–if not close to a practical impossibility–to achieve 50% RH with indirect refrigeration at ice water temperatures. One product loss should be sufficient "education" that an adequate refrigeration plant is required.

As pointed out in Answer No. 1, heat may be required also to achieve proper RH control. Don't overlook, however, the possibility of using chemical air drying beds. Some of the new self-contained automatic machines are not very expensive in first cost or operation for use in a properly sealed, dry, refrigerated warehouse.

–R.L.F., Chgo.



a new foam plastic insulation of outstanding properties

Uni-Crest is an extremely lightweight homogeneous white material with a smooth, tough surface. It is composed of minute, individually closed cells, produced by expanding beads of polystyrene. The inherent properties of Uni-Crest make it an excellent low temperature insulating material.

Uni-Crest has a low K factor (thermal conductivity) and retains its insulating value indefinitely. Lightweight, strong, flexible, it has excellent bonding characteristics, is non-dusting and non-flaking, and can be cut and handled easily. Uni-Crest is inexpensive, too.

Write today for complete specifications and installation information on application of Uni-Crest to your specific problems. We will be happy to send you this, plus an actual sample of Uni-Crest.

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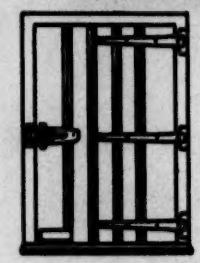
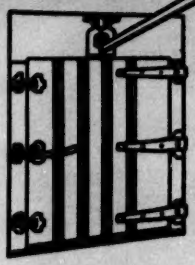
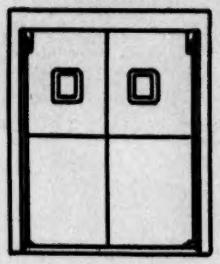
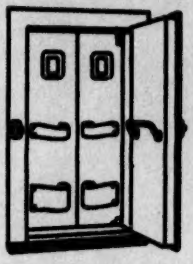




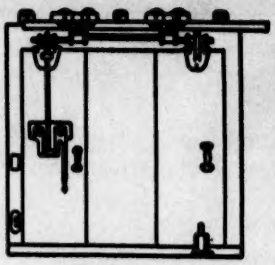
STANDARD COOLER-FREEZER DOORS

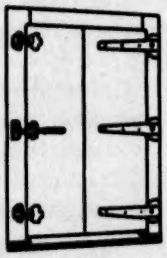


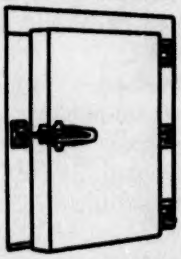


STANDARD VESTIBULE AND AUTO-CLOSE DOORS

HORIZONTAL SLIDING DOORS (Manual)







LOW TEMPERATURE INFITTING and OVERLAP

AUTOMATIC ELECTRIC DEFROSTERS
WITH THERMOSTAT CONTROL

CATALOGS AVAILABLE UPON REQUEST

FLEXIBLE RUBBER BATTEN DOORS INCLUDING STANDARD DOOR FRAME at no extra cost!

TYPE "TSH" WITH SEMI-HEIGHT MOUNTINGS

Especially adaptable for smaller door openings.

THEY PERMIT

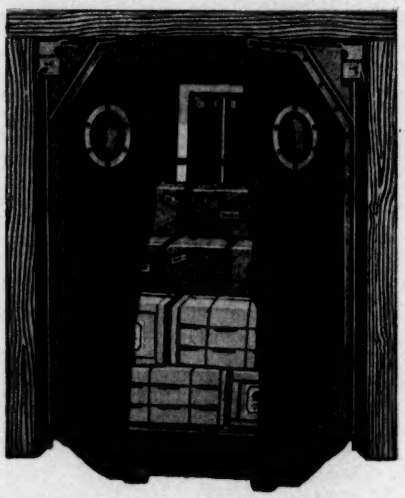
1. Safe passage of hand or power operated equipment with wider pallet loads.
2. Corner cutting with hand and power trucks.
3. Repeated abuse from impact of trucks at minimum damage and maintenance costs.

Model TSH battens are made of ¼" thick Neoprene (no grain) or of ¼" tough specially compounded rubber, reinforced with 2 layers of heavy cotton duck. Materials remain flexible even at extremely low temperatures.

Model TSH battens are furnished with No. 12 gauge galvanized steel jamb guards applied 4' 0" high with *no protrusions into the clear door opening.*

TYPE "FH" WITH FULL HEIGHT MOUNTINGS

Designed for wider and "straight traffic" doorways.



ADVANTAGES

1. Loss of refrigeration is held to a minimum.
2. Extra rigidity — tighter doorways.
3. Eliminates exposure and drafts near loading docks or at other openings.
4. Flexibility of battens permits repeated abuse and shock of mobile equipment contacts.
5. Permits movement of trucks and pallets at high speed in and out of refrigerated or other storage areas.

Model FH battens are made of ¼" thick Neoprene (no grain) or of ¼" tough specially compounded rubber, reinforced with 2 layers of heavy cotton duck. Materials remain flexible even at extremely low temperatures, and will not tear under most severe conditions.

BUTCHER BOY REFRIGERATOR

Electro SAFETY-SLIDE HORIZONTAL DOORS

FEATURING STRUCTURAL SIMPLICITY

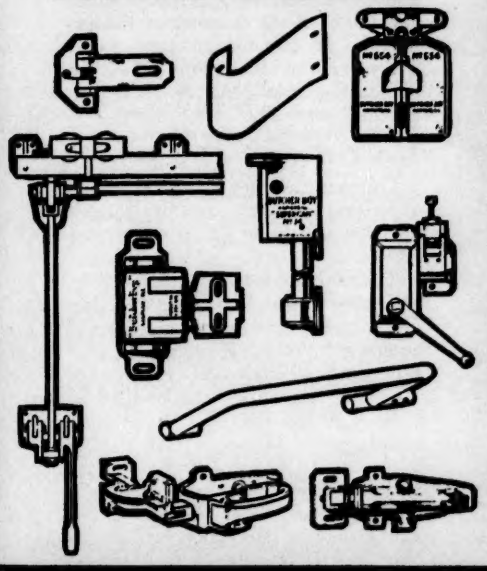
- **MECHANICALLY SOUND**
- **COMBINED "SPEED AND SAFETY"**
- **EXCLUSIVE AUTOMATIC SEALING "Gasket Assembly"**
- **SIMPLIFIED INSTALLATION**

Bi-Parting Horizontal Sliding Doors Available. CAUTION: Not recommended for use in cooler or freezer areas. Bi-Parting double horizontal sliding doors, of necessity, require gasket seals where the doors meet at the center of the opening. Hence, gaskets must be applied at "vulnerable" areas, exposed to contact by trucks or other objects which will rip or tear the gaskets, thereby destroying the necessary seal between the doors. *Field experience dictates this precaution against the use of bi-parting sliding doors.*

14 OUTSTANDING FEATURES

1 Overhead chain drive.
2 COMPACT—Electric Power Operator Assembly.
3 Heavy malleable iron Hanger Brackets.
4 Hyatt roller bearing Door Bracket.
5 Manual "Safety Release".
6 Automatic Sealing Assembly.
7 Automatic Electric Defrosters.
8 Concealed electric systems.
9 Safety Edge.
10 Complete Frame metal clad.
11 Special "SEAL" and "SILL" gaskets.
12 Defroster Drain Outlet.
13 Manual "Interior Safety Release".
14 "Roller-Type" Floor Wedges.

DURABLE HARDWARE



That Question Is Up Again -

REFRIGERATION GRADE vs FERTILIZER GRADE

▶▶▶ OFTEN RAISED is the question whether Fertilizer grade, also known as Commercial grade Anhydrous Ammonia can be used in place of Refrigeration grade. This comes about because Fertilizer grade can be purchased at a lower price than Refrigeration grade.

Fertilizer grade anhydrous ammonia does have a considerably higher content of impurities than refrigeration grade. Refrigeration grade is of higher purity to improve its performance in the refrigeration cycle.

The quality of the anhydrous ammonia at the manufacturing plant is important but the handling of the ammonia in shipping is equally so. Tank cars, tank trucks, and cylinders must be carefully processed and cleaned in order to assure the quality of the ammonia will be unchanged from the time it leaves the manufacturing plant.

In order to answer the question: "Can fertilizer grade ammonia be used in place of refrigeration grade ammonia in a refrigeration system?", a discussion of methods of manufacture of ammonia, specifications, handling of ammonia in shipping, and the refrigeration plant are in order.

Anhydrous NH_3 Manufacture

There are almost as many ammonia processes as there are plants in the United States. All these, however, depend on the fundamental ammonia synthesis reaction

$$N_2 + 3H_2 \blacklozenge 2NH_3$$

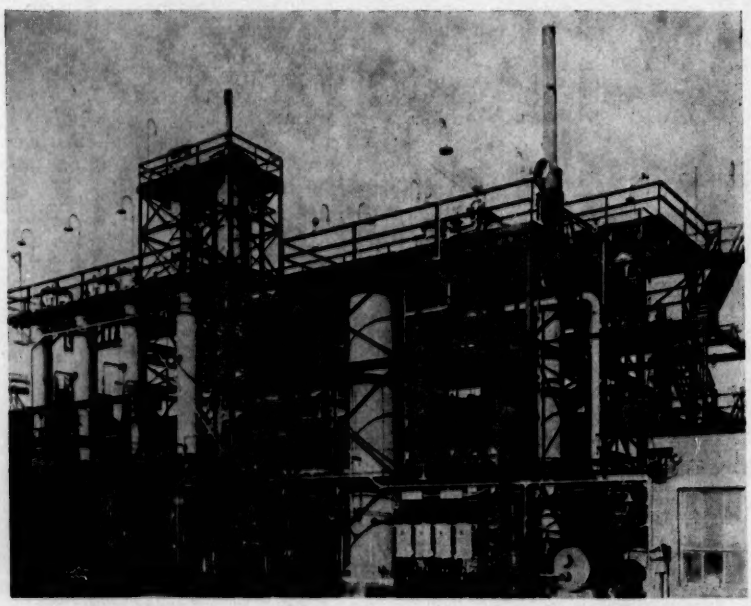
which requires pressure, high temperature, and a catalyst.

In the reaction, there is a liberation of 13,000 calories per gram mol of ammonia formed. The principle differences arise in the method of hydrogen production, and in operating pressures and ammonia recovery technique.

Natural Gases Replace Water Gas As Source

Prior to World War II, most hydrogen for synthetic ammonia production was made from water gas, using coke and steam as raw materials. Since World War II, the trend in hydrogen production has been in the direction of catalytic reforming of methane with steam at high temperatures:

$$CH_4 + H_2O \blacklozenge CO + 3H_2$$
$$CH_4 + 2H_2O \blacklozenge CO_2 + 4H_2$$



Ammonia distillation unit at Nitrogen Div., Allied Chemical Corp., Hopewell, Virginia, where impurities are removed resulting in a product for refrigeration use. High purity NH_3 is then tank car shipped.

Synthesis Gas

Super heated steam and natural gas in the ratio of 2:1, and air as source of nitrogen, are introduced to the reformer. A mixture of gases results, consisting of hydrogen, nitrogen, carbon dioxide, and carbon monoxide. After the carbon oxides are removed, the pure hydrogen and nitrogen mix is referred to as synthesis gas.

Synthesis gas is compressed to as high as 15,000 psig, then passed through a catalyst in the synthesis converter. A yield of 20 percent NH_3 takes place and the unreacted synthesis gas and ammonia gas are passed through a condenser where the ammonia gas is condensed and collected as fertilizer grade ammonia.

In order to obtain refrigeration grade ammonia, the fertilizer grade material is distilled and high purity ammonia is separated from oil, moisture, and non-condensable gases.

Specifications

As mentioned, there are two grades of anhydrous ammonia available; the refrigeration grade, and the fertilizer grade (known as commercial grade).

The difference in the two grades exists in the amount of impurities present and in the price. The specifications for the two grades are listed in Table I.

From Table I, it can be noted that the **impurities in fertilizer grade can be 25 times as great as the impurities in the refrigeration grade.** There are no limitations listed for non-condensable gases or residue in the fertilizer grade.

Tests Performed

Common tests for quality of liquid anhydrous ammonia are the **residue test, the non-basic gas test,** and the **oil test.**

The **residue test** is performed by collecting a one liter sample of liquid anhydrous ammonia with special equipment that will exclude all possible contact of air with the sample. The one liter flask is submerged in a brine bath containing a freezing point depressant and liquid ammonia is evaporated through a Bunsen valve.

When evaporation proceeds to a remaining volume of 100 mls of liquid ammonia, the contents of the liter flask is transferred to a gradu-

By DAVID H. WOOD

for Anhydrous NH_3 Refrigerating Systems ?

ated 100-ml tube. The evaporation continues in the 100-ml tube until all volatile matter is evaporated. The residue is determined by volume in the graduated portion of the flask. In general, this residue is moisture with a trace of oil.

The **non-basic gases test** is a test of the non-condensable gases in the gas phase of liquid anhydrous ammonia. This test involves collecting a sample of the gaseous ammonia in a graduated burette. The outlet of the burette is dipped in a 25 percent solution of sulfuric acid. The burette valve is opened and sulfuric acid will rise in the graduated burette as the basic gases are neutralized.

When the acid level in the burette is constant, the volume of unabsorbed gas in the capillary neck of the burette is read off. This volume is the non-basic gas. A table is given in terms of ML of Non-Basic Gas Per 225 ML of Ammonia sample and ML Non-Basic Gas/Gram of NH_3 Gas.

The **oil test** is determined by evaporating one liter of liquid anhydrous ammonia in a two liter Erlenmeyer flask stoppered with a vented stopper. When liquid anhydrous ammonia has completely evaporated, the oil residue is extracted with 100 ml of carbon tetrachloride. The extraction solvent is filtered through a filter paper into a platinum dish and evaporated in a steam bath. When all the solvent has evaporated, the dish is placed in an oven at 105 C. It is then removed, cooled and weighed. A blank determination is made on the solvent which is subtracted from the determination made on the oil.

Calculations are:

$$\frac{wt \times 100\ M}{M \times 0.682} = ppm$$

where

wt = weight in grams

M = 1000

Tests outlined above are made by all manufacturers and by some distributors.

. . . More

TABLE I – STANDARD SPECIFICATIONS FOR ANHYDROUS AMMONIA GRADES

	Refrigeration Grade	Fertilizer Grade
Ammonia Content % By Weight	99.98 minimum	99.50 minimum
Non-Condensable Gas ML/G	0.2 maximum	No specified maximum
Moisture, % By Weight	0.015 maximum	0.50 maximum
Residue, including Moisture, % By Weight	0.017 maximum	No specified maximum

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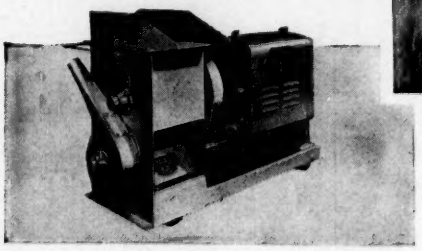

DAIRY PRODUCTS and other perishables remain cool and fresh in warehouse or en route to market under a uniform blanket of crushed ice.

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LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Sales Offices, Stock Carrying Factory Branch Stores and Distributors in All Principal Cities. Export Office: New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World.

Shipping Considerations

Anhydrous ammonia is shipped in 26-ton tank cars, approximately 14-ton transport tank trucks, 8-ton and smaller bulk ammonia trucks, and the conventional ICC approved cylinders. Tank cars and transport trucks are used interchangeably in anhydrous ammonia and liquid petroleum gas service.

In order to keep refrigeration grade NH_3 within specification, considerable handling technique must be applied. When the tank cars and tank trucks are used interchangeably for anhydrous ammonia and liquid petroleum gas, there is a definite chance of contaminating ammonia with moisture and hydrocarbons if the tank cars and transport trucks are not properly purged when making the change.

The same conditions will apply when equipment is used interchangeably for making fertilizer grade and refrigeration grade anhydrous ammonia deliveries. Before tank cars of refrigeration grade ammonia are accepted by most distributors, the contents of the car are tested by the methods outlined previously. If the car does not meet refrigeration grade specifications, it is rejected.

Delivery Precautions

Delivery technique must also be carefully observed by the distributors. In delivering to a refrigeration system, care must be taken not to transfer non-condensable gases from a poorly maintained refrigeration system to the tank truck. To prevent this, deliveries are made with high head pumps and without equalizing line. If the piping is improperly designed on the bulk truck, oil can be transferred from the refrigeration system to the tank truck.

If the proper type delivery hose is not used, moisture can be picked up by the ammonia in the hose. It is known that some steel reinforced rubber hose will leak ammonia badly enough to permit moisture transfer through the wall of the hose.

Before bulk stations and suppliers ship anhydrous ammonia in cylinders, an evaporation test of the contents of each cylinder is performed immediately after the filling. This is necessitated by the fact that cylinders may be returned to distributors containing moisture and/or oil, and at times non-condensable gases.

Distributors have developed considerable technique in keeping refrigeration grade anhydrous ammonia free of contamination in order to meet the demands of those users who must have this grade.

Grade Performance In Refrigeration Systems

In order to compare the performance of refrigeration grade anhydrous ammonia with fertilizer grade in a refrigeration system, the difference in composition of the two grades should be known. The specification for refrigeration grade is that it shall test not less than 99.98% NH_3, as compared to a specification of 99.50% NH_3 for fertilizer grade.

From this, it is apparent that the impurity content of the fertilizer grade can be 25 times as great as the impurity content of the refrigeration grade. Among the impurities which may be found in fertilizer grade are moisture, oil, carbon dioxide, carbon monoxide, nitrates, and non-condensable gases, principally oxygen and nitrogen.

More Purging Required

No doubt, refrigerating engineers are familiar with the fact that the presence of non-condensable gases causes the head pressure on refrigeration systems to run higher for the same condensing water temperature. The power required to make a given quantity of refrigeration increases as the head pressure increases. When non-condensable gases are present, it is necessary to purge the system in order to dispose of them, and in so doing some ammonia is purged along with the non-condensables.

When the impurity is oil, the oil will form a film on the evaporators, reducing heat transfer efficiency.

High head pressures, ammonia loss and heat transfer reduction all contribute to higher operating costs, thus resulting in an expense instead of a saving in using fertilizer grade ammonia in a refrigeration system.

Corrosion Probabilities

In addition to the higher operating expense, the impurities in the fertilizer grade ammonia may have a destructive effect on the refrigeration system equipment.

The presence of moisture, carbon dioxide, nitrites and nitrates, ammonium salts form that are highly corrosive to mild steel. The effect of ammonium salts is to corrode the needles and seats in manual and thermostatically controlled expansion valves. Ammonium salts and moisture will cause thermostatically controlled valves to stick. The presence of non-condensable gases and moisture will cause compressor parts to corrode, thus reducing compressor efficiency.

A study is in progress at Georgia Tech Institute to determine the reasons for the failure of storage tanks used by the fertilizer industry to store fertilizer grade ammonia. Latest reports from this study indicate the failures are due to stress corrosion caused by the impurities in fertilizer grade ammonia. Failure of this type can take place in ammonia receivers in refrigeration systems where fertilizer grade ammonia has been used.

There is a great enough difference in quality between refrigeration grade ammonia and fertilizer grade ammonia to effect the operation of a refrigeration system if fertilizer grade is used in place of refrigeration grade.

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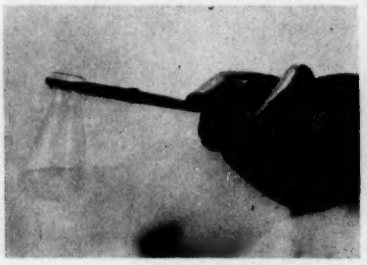

Flask of liquid ammonia drawn from a cylinder as a sample for testing.

Operator checks sample flask after evaporation of anhydrous ammonia taken from cylinder, to analyze for contaminants or impurities.

David H. Wood is Vice-president, Henry Bower Chemical Manufacturing Company, Philadelphia. Like many other chemical manufacturers, Wood and his firm have taken a keen interest in the perennial questions that came up in INDUSTRIAL REFRIGERATION on this topic (Nov. '58, Mar. '57, July and Apr. '55, Mar. '54). Like R.S.P., who also made a reply to this question as late as January 1959 (see pages 24 and 25, INDUSTRIAL REFRIGERATION), Wood decided to spell out for the owners and operators of refrigerating equipment the reasons why there is a difference in the pricing of refrigeration grade, and the effect of less pure grade ammonia on their refrigerating systems. Reprints of Wood's paper are available.

Birkenwald's Production Line Method of Cold Storage Door Manufacture Provides High Quality at Low Cost

Birkenwald Cold Storage Doors enjoy world-wide use and are installed as far away as South Africa, in South America, all through the Orient, and are on ships that sail the seven seas. They are used extensively in floating canneries in the fishing industry, in lumber camps, cold storage plants, food processing and meat packaging plants, ice cream plants, dairies, hotels, industrial cold storage plants, schools, hospitals and food markets.

Assembly of Birkenwald Cold Storage doors for Matson liners SS. Mariposa and SS. Monterey. Birkenwald doors like these are sailing the seven seas.

BIRKENWALD Cold Storage Doors

- Select 1-3/4" thick jamb backed with heavy jamb stiffener.
- Special 3/4" x 5" T & G back with expansion allowance.
- Birkenwald Standard Seal cellular sponge rubber gasket with moisture proof rubber skin coating. (Double Seal illustrated).
- Heavy diagonal brace. One piece of kiln-dried lumber, full height of door. No light sheet metal straps.
- Birkenwald SL-100 Heavy Duty Standard Fastener with adjustable roller strike, rear push release rod and steel back handle. Hot galvanized finish is standard. Wt. 14 lbs.
- Heavy 7/8" thick select kiln dried Douglas Fir door face.
- Standard Sill Gasket, 1/16" x 1-3/4" reinforced natural rubber. Easily replaced without removing door from hinges.

- Casing—1-3/8" x 5-1/2" select kiln dried lumber with blind screwed, full half lap corners. Frame jamb—1-3/4" thick select kiln dried lumber.
- Heavy lumber hardware backing.
- Insulation as specified.
- Vapor seal of waterproof paper or asphalt emulsion.
- Birkenwald Duo-Flex automatic self adjusting hinge with adjustable spring pressure. Heat treated Ductile Iron with hot galvanized finish.

All lumber used in Birkenwald Door construction is select kiln-dried Douglas Fir or Sitka Spruce (Mfgs. option).

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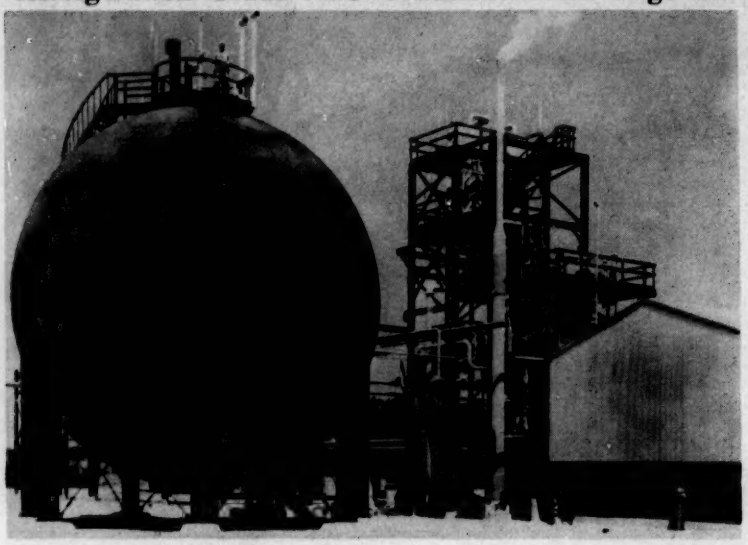
Refrigeration Grade NH_3—Continued from Page 26



Ammonia storage hortonsphere, Nitrogen Division plant, Allied Chemical Corp., Omaha, Nebr. Purification system is on right. Note operator in extreme lower right of scene, drawing samples for analyzing.

Conclusions:

The drop in operating efficiency and the damage to equipment will far exceed the extreme small price advantage that may be offered between fertilizer grade and refrigeration grade.

Obtaining refrigeration grade ammonia from a reliable source is most important, since experience in bulk ammonia tank truck deliveries and tank truck maintenance is essential to high quality ammonia. The same experience must be applied to ICC cylinder handling.

Control tests are applied with the intent to reject any ammonia that does not meet with refrigeration grade specifications and if maintenance of truck tanks and ICC cylinder is followed along with proper procedures in making tank truck deliveries, refrigeration grade ammonia of high purity can be assured at all times.

Ammonia Plant Sites Suggested For Hydrogen Isotope Production

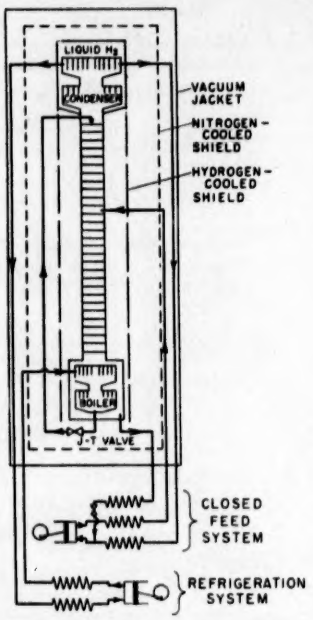


Fig. 1—CEL Pilot Plant Feed Schematic

▶▶▶ DEVELOPERS of a new hydrogen isotope[1] cryogenic distillation method feel that it is feasible for American industry to produce large quantities of deuterium if they will locate near ammonia manufacturing plants. Hydrogen gas, a by-product of ammonia synthesis, is used extensively in the new system for producing this nuclear reactor moderator, deuterium oxide or heavy water.

The suggestion of locating in industrial areas near ammonia plants is contained in a SUMMARY TECHNICAL REPORT on the Low Temperature Distillation of Hydrogen Isotopes released by the National Bureau of Standards, USDC in April. The report covered experimental work at NBS Cryogenic Engineering Laboratory, Boulder, Colorado, where scientists have advanced a practical solution to the problem of separating three isotopes of hydrogen; namely, protium, deuterium and tritium.

Pilot Plant Warranted

Demand for deuterium is growing. Also, with the declassification of thermo-nuclear fusion research programs, the stepped-up tests for peace-time amounts of deuterium-free hydrogen are needed, such as to warrant pilot plant manufacture.

Heavy Water Methods

More common methods employed to manufacture heavy water have certain disadvantages. Separation factor, ratio of vapor pressures of the two constituents at the boiling point of the system; number of distillation stages needed to produce a high concentration, very large heating and cooling requirements, are among some of the drawbacks. Separation by electrolysis necessitates several hundred stages. Dual temperature processes used by a number of heavy water manufacturers employs hydrogen and hydrogen sulfide, the latter being corrosive and poisonous both to human beings and catalysts. Hazards, plus the time involved if no catalyst were used, make this exchange method also unsuitable.

Until recently large scale distillation for the purposes of hydrogen deuteride recovery had been rejected. Main deterrents, according to the NBS, were lack of design data and the problems encountered in operating units at the extremely low temperatures that are required for distilling liquid hydrogen. Temperatures to minus 423 F are required.

Continued on Page 30

[1]For further details, see Low-temperature distillation of hydrogen isotopes, by K. D. Timmerhaus, D. H. Weitzel, and T. M. Flynn, Chem. Eng. Progr., Ju 1958.

Industry Meetings

Air Cond'g & Refrig'n — **May 3-6**
AIR-CONDITIONING AND REFRIGERATION INSTITUTE
The Homestead, Hot Springs, Va.

Plant Engineering; Maintenance — **May 4-5**
AMERICAN SOCIETY OF MECHANICAL ENGINEERS
National Maintenance, Plant Engineering Conference
Edgewater Beach Hotel, Chicago

Ice Marketing — **May 8-9**
SOUTHWESTERN ICE MANUFACTURERS ASSN.
Annual Spring Sales & Management Conference
Navarro Hotel, Corsicana

Production Engineering — **May 12-14**
ASME PRODUCTION ENGINEERING CONFERENCE
Statler-Hilton Hotel, Detroit, Mich.

Fire Protection — **May 25-29**
NATIONAL FIRE PROTECTION ASSN.
Atlantic City, N.J.

Materials Testing — **Jun. 21-26**
AMERICAN SOCIETY FOR TESTING MATERIALS
Chalfonte-Haddon Hall, Atlantic City, N.J.

Refrig'n & Air Cond'g. — **Jun. 22-24**
AMERICAN SOCIETY OF HEATING, REFRIGERATING & AIR CONDITIONING ENGINEERS
Lake Placid Club, Lake Placid, N.Y.

International Refrigeration — **Aug. 19-26**
TENTH INTERNATIONAL CONGRESS OF REFRIGERATION
Copenhagen, Denmark

Cryogenics — **Sep. 2-4**
CRYOGENIC ENGINEERING CONFERENCE
University of California, Berkeley

Meat Packing — **Sept. 25-29**
AMERICAN MEAT INSTITUTE
Palmer House, Chicago

Dairy Conventions — **Oct. 4-10**
DAIRY INDUSTRY SUPPLY ASSN.—Oct. 4-10
Saxony Hotel, Miami Beach
MILK INDUSTRY FOUNDATIONS—Oct. 5-7
Fontainebleau Hotel, Miami Beach
NATIONAL ASSN. OF ICE CREAM MFRS.—Oct. 7-9
Eden Roc Hotel, Miami Beach

Ice Manufacturing — **Oct. 20-24**
NATIONAL ICE ASSOCIATION
Sheraton-Dallas Hotel

Air-Cond'g & Refrig'n Exposition — **Nov. 2-5**
11TH EXPOSITION OF THE AIR-CONDITIONING AND REFRIGERATION INDUSTRY
Convention Hall, Atlantic City, N.J.

Ice Engineers — **Nov. 11-12**
SWIMA ANNUAL CONFERENCE OF ENGINEERS
Rice Hotel, Houston

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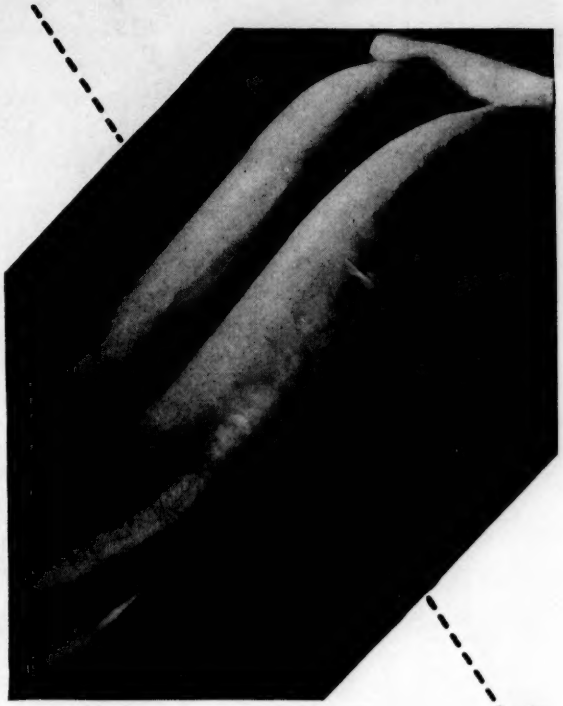

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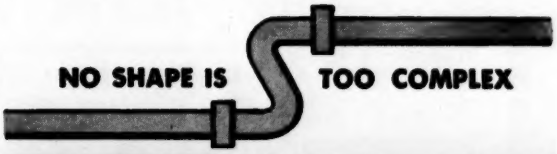

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NH_3 Plant Sites — Continued From Page 28

Method Devised At CEL

A pilot plant capable of distilling liquid hydrogen by fractionation has yielded specific amounts of pure liquid deuterium and deuterium-free hydrogen. The unit, the only one of its kind in the country, was designed by Cryogenic Engineering Laboratory (CEL) staff members T. M. Flynn, K. D. Timmerhaus, and D. H. Weitzel. According to NBS, this pilot plant size yields information directly applicable to commercial-size heavy water production units.

The flow system of the column (Fig 1) consists of three separate parts—circulation, condenser, and feed. In the circulation system, a heat pump, operating between the condenser and the reboiler, provides the necessary refrigeration at the top and associated boil-up in the reboiler. Hydrogen gas, the circulating refrigerant, transfers heat from the condenser to the boiler. This operation supplies sufficient heat to fulfill the requirements of the system.

Condenser and reboiler systems employ finned heat exchangers and a reservoir or heat sink of liquid hydrogen. A resistance-type liquid-level sensing device and a solenoid valve on the transfer line keep the reservoir filled automatically. The heat sink furnishes hydrogen needed for refluxing.

Low Temperatures Reverse Some Common Characteristics

Many of the problems encountered in designing this pilot plant are characteristic of standard distillation operations, says the NBS report. However, a few arose which are peculiar to low-temperature units. For instance, in high-temperature units, heat loss is from the column. As a result, some additional vapor will condense to a liquid within the column. This means an increase in the internal reflux ratio. In addition, transfer of energy (away from the column) requires that size of the reboiler be increased to compensate for this heat loss.

In low-temperature operations the effect is just the opposite; that is, a decrease in the internal reflux and a corresponding decrease in the hydrogen-deuterium separation. Since stepping up the refrigeration efficiency of the system is expensive, CEL engineers designed a compact "cold box", crowded with components, to minimize heat leak. The column and accessories are suspended inside a vacuum—the cold box.

The pilot plant designers have used another approach in solving the problem of radiation heat transfer—a set of insulating shields. Surrounding the column is an inner shield of thin copper sheeting. It is attached to the hydrogen reservoir, at the top of the column. Because of copper's high thermal conductivity, the design can provide a shield having the same temperature gradient as the column, top to bottom. Thus, heat radiated from the shield to the column is negligible. Reduction of the heat transferred to this copper shield from outside the column is effected by placing a liquid-nitrogen-cooled shield around the inner shield.[2]

As the CEL engineers see it, the only major item causing a change in design between this pilot plant and an industrial unit is the provision for a supply of pure gaseous hydrogen to the column feed. Hence, the suggested location near NH_3 plant sites.

[2]A thorough discussion of low temperature insulation problems is given in *Cryogenic Engineering*, by R. B. Scott, D. Van Nostrand (1959).

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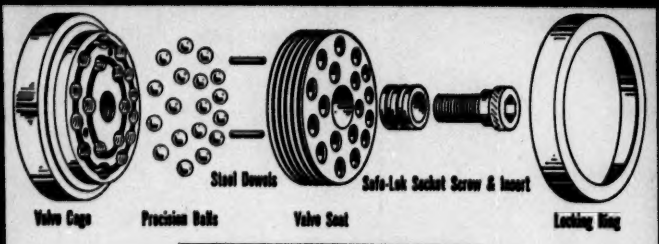

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Will Increase Performance of ANY Compressor!

For: Y-6½ x 6½

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- 26% to 80% More Gas Passage
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PERSONS IN THE NEWS—Businessmen, Engineers, Manufacturers

Bartilotta Joins Pick Engineering

RECENT addition to the home office engineering department staff, Pick Hotels Corp. is **Frank A. Bartilotta,** a past officer of Chicago Chapter, NAPRE. Bartilotta will be engaged in mechanical engineering activities, with particular emphasis on air conditioning and refrigeration. He first came in contact with the Pick organization when he was assigned by Westerlin and Campbell Corp., then the York contractual organization at Chicago, to the Pick-Congress when that hotel was installing its air conditioning.

Bartilotta handled the inspection tour of the Congress air conditioning installation during the Regional Educational Conference in Chicago in 1956. He has had training in interior design and layout at such institutions as the Ray School of Arts and the Chicago Academy of Fine Arts. He supplemented this training and his practical experience with mechanical and architectural schooling at the Illinois Institute of Technology. He is a veteran of World War II.

Student Elected Director Of Carthage Missouri Firm

PRESENTLY A STUDENT at the University of Missouri School of Law, **James Robert Spradling** was named a director of the Carthage Ice & Cold Storage Co. at the annual stockholders meeting early in March. All other officers and directors of the cold storage firm remain the same. Harry A. Spradling is president, Harry M. Spradling, executive vice-president, C. K. Rowland, St. Louis, vice-president, Mrs. Harry M Spradling, secretary and Lee Waller, Wichita, Kansas, treasurer.

East Promoted

ADVANCED from chief engineer at Sidney Meat Company, to chief engineer at the Waterside Cold Stores, is E. East, Sidney, Australia. East is an active member of NAPRE in Australia.

Queensen Manages Booth at St. Paul

BOOTH COLD STORAGE CO., Division of Booth Fisheries Corp., announced in mid-March, the appointment of **Kenneth R. Queensen,** as manager of the St. Paul, Minn. facilities. W. L. **Davis,** vice-president and general manager, Booth Cold Storage Co., made the announcement. Queensen came from St. Louis, where he was formerly affiliated with another cold storage.

Texas High School Senior Constructs Solar A/C Plan

SCIENCE SERVICE reported in February that a 17-year old Baytown, Texas high school senior has constructed a 5-ton solar energy operated refrigeration unit for air conditioning a home. This student, **Paul H. Corneil,** won a place on the top 40 winners of the 18th Science Talent Search for the Westinghouse Science Scholarships and Awards conducted annually by Science Clubs of America.

Component systems of the 5-ton unit for which Corneil calculated the flow rates, use pentane as the refrigerant, kerosene as the absorber liquid and methane as the circulating light gas. Since solar energy is abundant in Baytown when space cooling is most needed, this young scientist found that an ordinary flatplate collector worked very efficiently. However, he reported that it could be supplemented by a gas fired heater if and when necessary. The refrigeration is by absorption.

Sporlan Distributes Hubbell Valves

ST. LOUIS—Distribution arrangements were recently completed between Hubbell Corp. of Mundelein, Ill. and Sporlan Valve Co. here, the latter firm announced.

This affiliation now affords a ... source of supply to the users of "Peak Performance Products," it was stated.

"The principal products being added to the Sporlan line by ... are ... back pressure regulating valves, combination back pressure and stop valves, plus large capacity solenoid valves," the announcement ... "These are ...

Here's why Sporlan chose Hubbell Valves...

• For a reliable source and a top quality line of back pressure regulating valves and combination back pressure and stop valves, plus large capacity solenoid valves Sporlan chose Hubbell Controls. They will augment the now famous line of Peak Performance valves and accessories of Sporlan. Quality cannot be compromised for price . . . neither can the long standing reputation of Sporlan.

• Hubbell's precision made controls are a well known hallmark in the refrigeration and air conditioning industry.

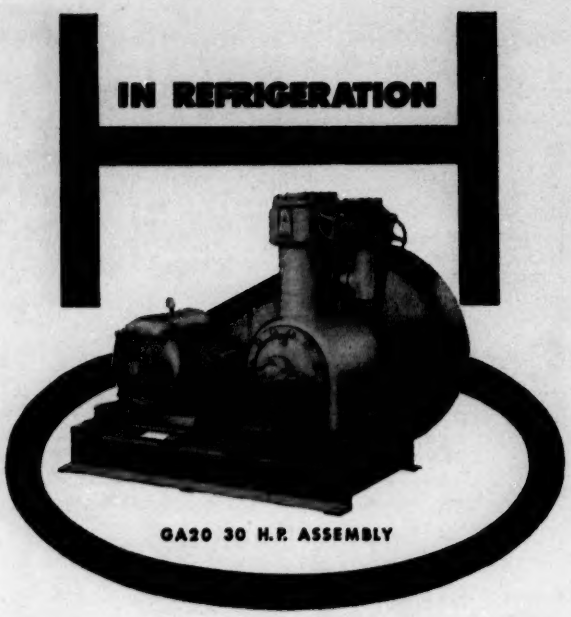
• Hubbell Controls may be slightly higher in cost but the combination of control dependability and precision craftsmanship will save you costly shut-down time.

• So . . . buy nothing less than the best . . . it's quality and performance that counts. You can be assured of both with Hubbell and Sporlan controls.

E. B. LaPlante
GENERAL MANAGER

HUBBELL CORPORATION
MUNDELEIN, ILLINOIS
BACK PRESSURE REGULATOR VALVES • DUAL PRESSURE REGULATOR VALVES • AUTOMATIC SUCTION STOP VALVES • SOLENOID VALVES • GAUGES • SAFETY RELIEF VALVES

"Castings to finished controls . . . every inch HUBBELL!"



THERE IS A *BIG* DIFFERENCE in refrigeration equipment . . . not so much in the actual materials, although they are very important, but in the in-built intangibles such as the builder's integrity, the engineering experience, the degree of specialization and the manufacturer's reputation.

These are the things that control the profit margins for the equipment's user . . . these are the *important* things that make the *Big* difference.

In Refrigeration—it's *all* in knowing HOWE!

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P&C Markets Starts

POWER OPERATED WAREHOUSE DOORS

▶▶▶FAST AND EASY ACCESS to cold storage compartments is a fundamental must with P. & C. Food Markets, Inc. near Syracuse, N. Y. Their grocery warehouse, recently completed in its first phase, is mechanized throughout to facilitate the movement of food stuffs.

An underground track system draws order make-up carts around the main storage bays and loads of pallet size, in-bound and out-bound, are handled by fork lifts. According to the director and design engineer of the food marketing firm, it was only logical therefore that three power operated cold storage doors should be employed to speed movement of trucks and traffic to and from refrigerated areas.

Known as *Electroglide* doors, the three units are each single leaf horizontal sliding type built by Jamison Cold Storage Door Company, Hagerstown, Md. High volume traffic through the doorways is permitted by quick opening and closing action, estimated as averaging more than 50 operations daily, each door. Costly time, labor and refrigeration losses are thus minimized.

Three-Part Storage

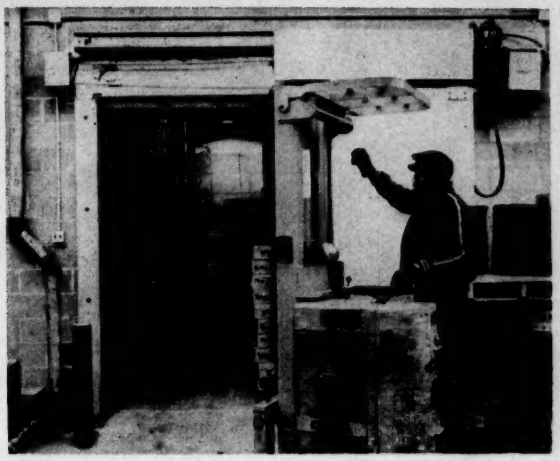
Refrigerated area is 84x56x22-ft high, of concrete block construction and insulated to standard thickness to efficiently maintain a temperature of minus 10 F. The floor has ventilated space beneath to prevent frost heaving.

Temporary insulated plywood partitions divide this low temperature storage into three cold storage areas. Eventually the entire area will be used for frozen food storage, but at present the other two sections are used for the storage of commodities requiring higher temperatures, such as cheese, butter, and various dairy products. Another phase of the construction will provide high temperature storages for those commodities, at which time the frozen food storage will be expanded to the full area.

Refrigeration System

Refrigeration of the cold storage bay is accomplished by means of a dozen *Copelametic* Refrigerant 12 units. Those condensing units presently serving the higher temperature areas will be applied to the new construction planned. Sufficient compressor capacity and evaporative surface is already installed to accommodate the expanded frozen food storage when that move takes place.

Upstate N.Y. Storage



CHOSEN FOR LABOR SAVING FEATURE

Only four of the dozen units presently serving the area, refrigerate the frozen foods compartment.

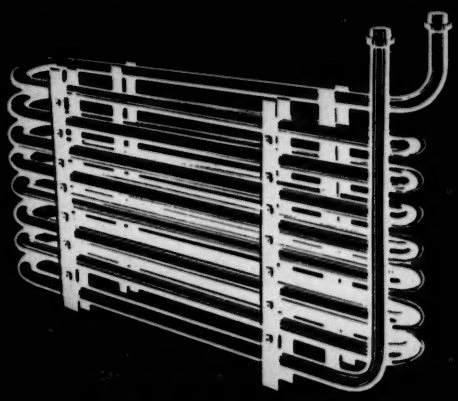
Fast and smooth operation of the power operated doors helps substantially maintain proper temperatures in both the freezer and the two cooler rooms. The doors are equipped with *Frostop* heater cables which eliminates casing condensation and the possibility of doors to the frozen food compartment freezing shut. Activated simply by a pullcord and micro-switch, the doors are a popular labor saving feature with the warehouse employees, according to P. & C.'s Director and Design Engineer, Holland Gregg.

Equipment Arrangement

An air cooling feature utilized by P. & C. in their supermarkets has also been extended to their warehouse equipment room. That area is equipped with four outside air louvers and four circulating fans, located at opposite ends of the equipment room. When the temperature in the equipment room increases as each refrigerating unit goes into automatic operation, three each of the louvers and ventilating fans are thermostatically activated in sequence to provide increasing air circulation through the equipment space. A fourth louver set and fan are operated manually, generally being placed in operation continuously in the summer months. The arrangement might be called an indirect air condensing method, the equipment room considered as a vessel.

Mechanical Door Features

Like the air circulation, the refrigerator doors work almost automatically, requiring only the effort of the operator to pull the cord. A special cam lock compression seal on each door assures a tight closure. The doors close with an "in" and "down" motion that means positive contact for all gaskets. All gasket contacts are visible so that it is possible to see that the doors are sealed. A spring cushion chain link absorbs inertia when the doors are opened, and absorbs momentum when they are stopping or reversing. Springs counter balance the weight of the door when it is in motion. This, it is claimed, makes possible level movement with minimum power and firm, gentle closure.



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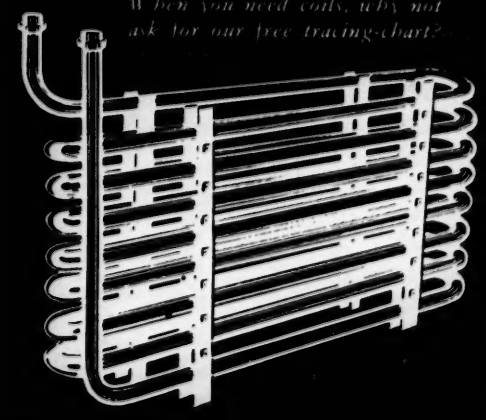
are today standard in the industry, specified by a third generation of users who base their preference on *observed performance*.

With over 75 years of progressive engineering and expert production reflected in their smooth bends, skillful welds and accurate measurements . . . NATIONAL Refrigeration Coils just naturally *pay off* in lower maintenance, higher efficiency, greater longevity.

NATIONAL QUALITY also guarantees effective service in CONVERTORS (our new Catalog 592), HEATERS & HEAT EXCHANGERS (our new Catalog 591).

When you need coils, why not ask for our free tracing-chart?



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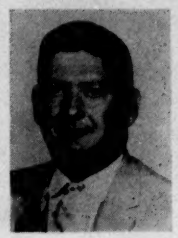
Persons In The News — Cont'd From Page 31

Changes At United Fruit

▶▶RETIRING after 42 years of service with United Fruit Co. is **John N. Kelley.** He stepped down the first week of March. **Vincent J. Hewitt** succeeded Kelley in the dealer and service departments of Fruit Dispatch Co., a sales subsidiary of United.

Kelley had also been manager of fruit transportation for the Fruit Dispatch Co., and a director of transportation and general research for the parent firm. He had been with the organization since 1917 and will continue on a consulting basis for one year, visiting and reporting on installations in Europe.

In February 1947, for his contributions in the field of transportation of perishables, Mr. Kelley was presented the William Garfitt Foundation award for outstanding service to the fresh fruit and vegetable industry. He is a recently appointed member of the National Academy of Sciences' U. S. committee for the International Institute of Refrigeration. He is a member of ASHRAE.



Hewitt, a resident of Elmont, Long Island, has been with the Fruit Dispatch Co. since 1947 as a jobber service field engineer. He is a member of ASHRAE, and active in the U. S. Coast Guard auxiliary and Boy Scouts of America.

Thompson Featured By Texas Newspaper

▶▶TOMORROW'S LEADERS is the title of a series of articles running in the Dallas TIMES HERALD. It features a portrait and short story on young men believed by the publication to be some of the city's more dynamic leaders. **John P. Thompson,** vice-president, Southland Corp., was featured in a February article.

John Thompson is following in the steps of his father Joe C., who pioneered a drive-in grocery idea in Texas. Southland Corp. operates the *7-Eleven* chain which is still growing in Texas, and has expanded as far East as District of Columbia and the City of Baltimore. The firm operates a number of ice plants as well as Oak Farm Dairies, producers of milk, ice cream and other dairy products. They also carry the *Circle T* meats, a line of frozen meats and Mexican dinners, and on January 1, this year, acquired controlling interest in the Cabell Food Store chain.

The article described Thompson's duties as vice-president, his service experience, university achievements, family activities and social works in the City of Dallas.

Bass Joins Krack

▶▶ADDITION of **Russell B. Bass** to the sales organization of Refrigeration Appliances, Inc., Chicago manufacturer of refrigeration and air conditioning equipment under the "Krack" trade name, was recently announced by **Frank Klaas,** vice-president, sales. Bass is an active member of ASME, ASRE, and NAPRE. He was formerly sales manager, J. E. Watkins Co.

Kastello Shingle Hung In Milwaukee

▶▶SPECIALIZING in heating, ventilating, refrigeration and air conditioning, **Thomas F. Kastello** hung out his shingle as a professional engineer in West Allis on the outskirts of Milwaukee in February. Kastello was formerly associated with consulting engineers, Holland & Beseke.

6-Station unit: 240—5" x 4¼" packages per freeze . . . all refrigeration and hydraulic equipment self-contained . . . uses R22 refrigerant . . . only 17 sq. ft. of floor space required . . . patented DOLE "Thermo-Film" feature increases freezing speed up to 10% . . . installation requires only electrical, water and drain connections.

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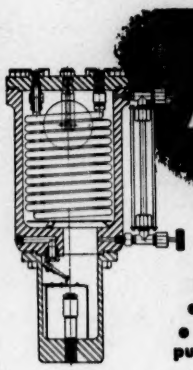
5938 NORTH PULASKI ROAD, CHICAGO 46, ILL.
103 PARK AVENUE, NEW YORK 17, N. Y.
Canada: Dole Refrigerating Products Limited, Oakville, Ont.



- Full automatic gas flow to condensing coil.
- Full automatic air discharge.
- No adjustments necessary during purging.

Armstrong forged steel purgers with automatic air and non-condensible gas discharge relieve engineers of guessing as to when the system is completely purged. Unit allows only non-condensibles to escape, saves on refrigerant.

Since no adjustments are required during operation, the engineer is free for other duties.

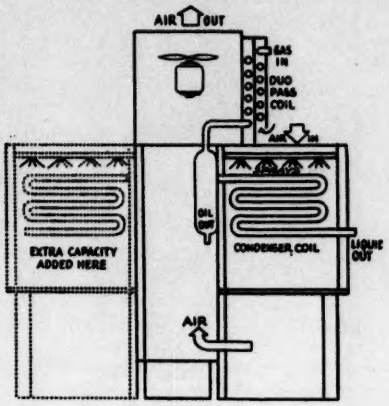
The purger can be operated continuously or intermittently. Send for free 4-page Bulletin No. 2211—Learn how Armstrong Purgers cut refrigeration costs, write:

ARMSTRONG MACHINE WORKS
8603 Maple Street • Three Rivers, Michigan
Satisfaction Guaranteed

Better check on Armstrong High Side Floats and Liquid Seals, too!

"WHAT'S NEW" (Continued)

Condensers, Coils, Instruments Offered



New Condenser Lines

▶ DISTINCTIVE FEATURE of a new evaporative condenser line by Niagara is their standardization with regard to organization and size. Condensing coils, casing sections and spray equipment can be assembled to fit close to the actual capacity needs of an existing refrigeration plant, or provide for plant expansion directly to load requirements. The standard units are easily assembled and erected in the field. All components are detachable, simplifying maintenance and access for inspection. Applicable to ammonia and halocarbon refrigerants, the condensers are available in sizes from 10- to 190-TR in increments of 10 tons; from 200- to 350-TR in 25 ton increments.

New Btu-Meter

▶ CUSTOMER BILLING, and cost accounting of refrigeration or heating furnished by central station air conditioning systems using chilled or hot water, can be accomplished by a new Btu-meter introduced by a Garland, Texas firm. Temperature change of the hot or cold water is multiplied by the flow, and two counters register the heat transfer and the amount of water passed. Indication of differential temperature is provided.

The Btu meter may be located up to 10 ft away from the flow measuring element in a position convenient for reading and checking. Any volume of water above 1/4 gpm can be metered. Literature and price lists are available. The unit is available with either conventional water meter, or an orifice flow meter for process applications.

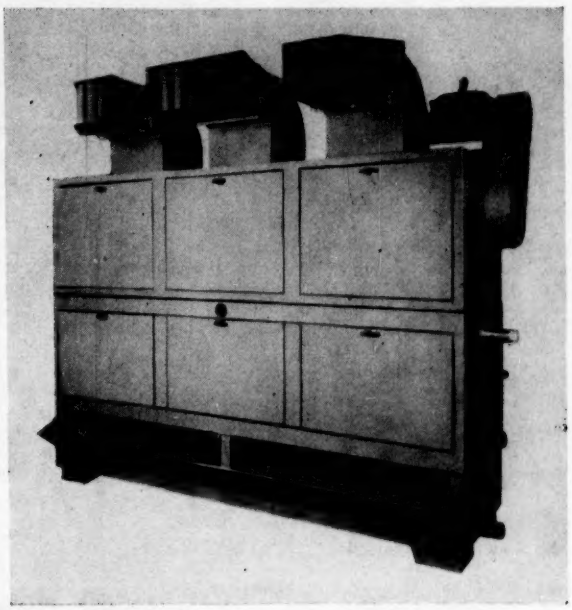
4,000—30,000 CFM COLD DIFFUSERS

for high or low temperature —hot gas or water defrost

All refrigerants can be utilized—including ammonia and brines. Coil and drain connections can be made at the right or left independent of the blower section. Blowers can be adjusted to front, rear or top discharge on the site.

Capacities: 1240 to 26,700 BTU/hr. at 1° T.D.
Total surface area: 321 to 8360 square feet.
Fin spacing: 3 or 4 per inch.
Construction: heavy 12-gauge welded steel; hot-dipped galvanized blower wheels and scrolls; hot-dipped galvanized casings available.

Send today—for your copy of free bulletin and help on installation and refrigeration problems.



KRACK REFRIGERATION APPLIANCES INC

Manufacturers of freon, ammonia, flooded ammonia heat transfer equipment

REFRIGERATION APPLIANCES, Inc., 911 Lake St., Chicago 7, Illinois
Send free bulletin giving all technical details.
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Firm_____
Address_____
City_____ Zone____ State_____

There's a Place in Your Planning For Kohlenberger Engineering

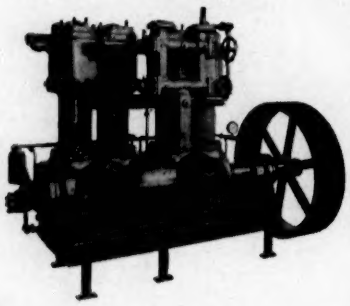
Kohlenberger's extensive manufacturing facilities and experienced staff make it possible to offer industry a *complete* service in the development and installation of heavy duty industrial refrigeration and air conditioning equipment.

For 36 years Kohlenberger Engineering Corporation has built its reputation on the dependability and quality of its equipment and the skill and integrity of its engineering staff.

Kohlenberger services include:

Equipment Manufacture
Refrigeration System Design
Plant Layout
Field Erection

When quality and dependability count ... contact Kohlenberger!



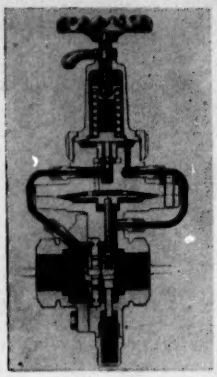
Kohlenberger 100 H. P. heavy duty industrial VSA ammonia or freon compressor. Other models available.

Write for free illustrated brochure.

KOHLENBERGER ENGINEERING CORPORATION

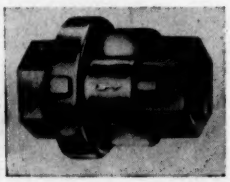
1610 Commonwealth Avenue, Fullerton, California

Continuing, "WHAT'S NEW"

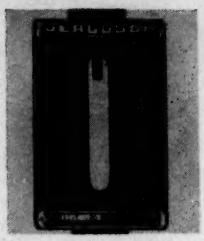


More Fittings, Indicators

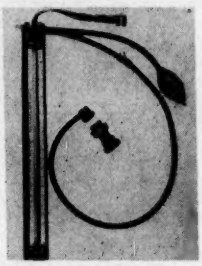
▶REDESIGNED, a piloted pressure regulator valve incorporating a patented sliding gate and plate seat in 1/2- to 2-in. sizes has been announced by a Cincinnati firm. Available in several materials, suitable for pressures up to 250 psi and temperatures to 450F, the new design is said to provide accurate regulation with no wire drawing and a tight shut-off. Equipped with external sensing tubes, handwheel and thumblock ball bearing adjustment, the valve also features a *Teflon* pilot seat and is satisfactory for use on steam, water, air, oil, gas and chemicals. A bulletin giving complete data, is offered.



▶REGULATING water flow, as make-up feed regulator to cooling towers, and controlling jacket water for refrigerating compressors, is an ideal application for the new *L-P-D Mesurflo* fitting. Manufactured by an Erie, Pa., firm, this flow regulating device automatically permits a specified rate of flow regardless of inlet pressures. For hot or cold water, it is available in 49 flow rates from 1/5 to 50 gpm. Bulletin on request.



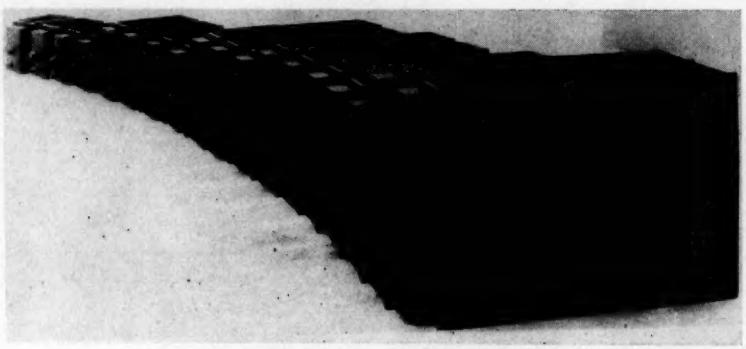
▶USED AS a drip sight feeder or as a small flow indicator, a new high pressure fitting is offered by a Burlington, Mass. firm. Patented non-frosting design is available for low temperature service. It is available in three small pipe size connections for use where drip-feeding is required under high pressure or for corrosive conditions. Chambers and covers are rust proofed.



▶ANOTHER DEVICE recently introduced for measuring low gas pressure or vacuum is the *Pneumatometer*. Based on a new principle, the *Pneumatometer* is claimed to take direct accurate readings, in either inches of water, or pounds and ounces. Produced by a Norwalk, Ohio firm, it can be used in place of a mercury manometer, water gage, spring gage, or vacuum gage. The instrument contains no springs or diaphragms, is precision built and can be used very rapidly for checking pressure or leaks in a closed system.

Air Conditioning Season Opens New Equipment Lines

▶RECENT COMPLETION of a new plant by Marlo, St. Louis manufacturer, enabled the firm to widen its range of sizes of heating and cooling coils offered the industry. Typical of the line offered is the array of 18 coils pictured.



Refrigerated Environmental Testing

West Coast NAPRE Conferences

Trends, Controls, Oil Are Northwest Topics

▶▶MODERN TRENDS in refrigeration was the lead-off topic at the one-day Regional Educational Conference, NAPRE, held at the Olympia Brewing Company, Olympia, Washington, April 25, 1959. One speaker was Frank Knowles, a founder-member of Washington Chapter No. 1, NAPRE, who is manager of Belt-Ice Company, Seattle.

Other speakers at the April 25 meeting were Chet Bell, charter member of the newly established Portland, Oregon Chapter and W. M. Fiander, The Texas Company, Seattle. Automatic Controls on Refrigerating Systems was the topic presented by Bell. Characteristics of Oil for the Refrigeration Industry was Fiander's topic.

This was the third annual Northwest Regional Conference sponsored by the NAPRE chapters in the Puget Sound area; Washington No. 1, Seattle, Washington No. 2, Tacoma, and Olympia chapters. Yakima and Spokane, Washington chapters sent delegates to the conference and the newly established chapter at Portland was represented for its second year.

The Northwest chapters established a special organization for directing their Regional Educational Conferences. Bert Holmes, Olympia, was Northwest Regional Board Chairman; Archie Waterbury, Tacoma, Educational Chairman; Charles E. Devine, Olympia, Secretary-treasurer; and Bob Jones, Olympia, Publicity Chairman.

Process, Construction Lead California Talks

▶▶MODERN POULTRY Processing Plants was the subject of one paper presented at the California Regional NAPRE Conference held at Los Angeles, Mayfair Hotel, May 1 and 2. There were seven other papers, a forum and an educational demonstration.

Other topics included Trouble Shooting Refrigeration Controls, Pumps and Their Problems, Operation of Low Temperature Test Chambers, and Unusual Refrigeration Applications. New Cold Storage Construction Methods and Mechanical Railroad Car Refrigeration were also discussed.

Speakers selected included Pete McCarty, Sporlan Valve Co., Harold Halls, Recold Corp., Cy Otterholm, Richard Dawson Co., C. R. Kohlenberger, Kohlenberger Co., R. F. McKee, Pacific Fruit Express, Ed Nelson, Union Ice Co., George Paulick and Regis Gubser, California Consumers Corp., and Guy R. King, Santa Monica Junior College. Professor King is the vice-chairman of NAPRE's National Educational Committee and president of the Los Angeles Chapter, which was host to the eight California Chapters and members-at-large from the states of Arizona, Nevada and Utah.

An old tradition at the NAPRE Convention in the past, The Bureau of Refrigeration Information, was revived at the Friday, May 1 evening session. At this session participants submit questions in much the same manner as they are channeled to the Question Box in INDUSTRIAL REFRIGERATION monthly. Conference speakers and more experienced engineers in each question category answered the questions.

A rather unique feature of the Conference, the demonstration NAPRE class, was a variation of the National Chapter Clinic scheduled at the Annual Convention of NAPRE. However, the Los Angeles program featured a one-hour complete demonstration on How To Conduct The NAPRE Refrigeration Course.

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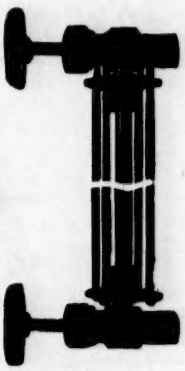

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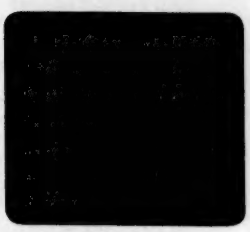

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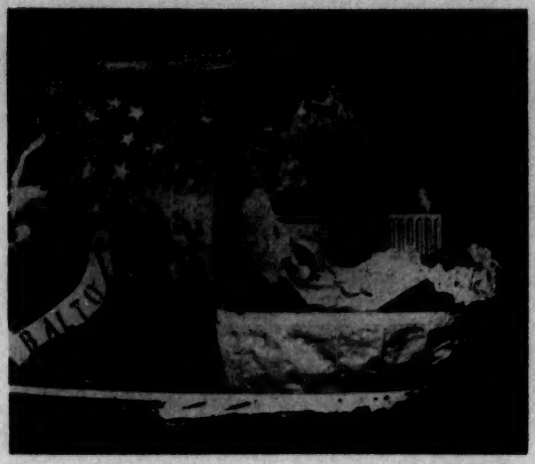

Close-up of the streamlined nose of a B-52 Bomber after a 47 second battle in a Texas hail storm.

Eight of these J-57 P&WA engines ate up metal and hailstones without damage, to bring the B-52 back. —*Photos Courtesy Pratt & Whitney Aircraft.*

▶▶ SIMULATED environmental testing has time and again proven worthy of investment. Typical example is an incident that occurred with a US Air Force Boeing B-52 last Fall, about the time INDUSTRIAL REFRIGERATION readers were learning that "Jet Tests Prove Engines Operative In Hailstorm", page 11, October 1958.

A routine mission turned into a nightmare for a 9-man crew and a testimonial for Pratt & Whitney aircraft engines and for environmental testing in general, when the plane ran into a small and very violent frontal area at 8,000 feet. Very suddenly the jet plane was bombarded with hailstones the size of baseballs, at 400 mph! The damage was terrific as the pictures accompanying this article will attest.

IR Reported Research

In the October article, IR reported that hailstones produced by environmental laboratories demonstrated that jet engines can operate in the most severe hailstorms likely to be encountered in commercial air lines operations. An operating test engine survived hails of 1¼-inch ice balls at speeds of 637 mph, and 2-inch ice balls at 378 mph, without any damage.

In the very real experience high in Texas skies last Fall, hail and metal pieces from the nacelles were sucked into the engines, crashing into the whirling turbine blades. While most of the instruments went out and the electrical system in the plane failed due to hail bombardment damage, the engines continued to run perfectly.

Shifting from automatic to manual control, the crew sped through the storm, learned that the landing gear was operational and landing flaps were functioning well, and then proceeded back to their Strategic Air Command base. For landing instructions, a diverted jet tanker rendezvoused with the crippled bomber and supplied the pilot with necessary instrument readings by radio.

The engines were reported serviceable even though they had congested a considerable amount of metal. The B-52 had been in the hail storm for only 47 seconds!

Borax Simulates Snow For Laboratory Work

▶▶ RAGING Polar snowstorms can be simulated realistically in the wind tunnel of New York University College of Engineering Research Division. However, the "snow", although it drifts and packs such as does snow in the Polar regions is not a water derivative, but Borax. Snow, Ice and Permafrsot Research Establishment, U.S. Corps of Engineers, sponsored the research project in connection with the U.S. Air Force's Distant Early Warning Line Project.

Third Annual Meet For Environmental Engineers

▶▶ FIFTY-FIVE SPEAKERS were presented in the program for the 3rd Annual Meeting of the Institute of Environmental Engineers, April 22 through 24 at the LaSalle Hotel, Chicago. Purposes and objectives of IEE are to advance the theory and practice of environmental engineering and its allied branches and related sciences.

Quality and numbers of the speakers on environmental topics indicated the aggressiveness of the Institute and the heavy emphasis on this field. An exhibit was sponsored in connection with the meeting. Over half the 37 exhibits were equipment which involved some refrigeration for simulating environmental conditions, or merchandising of expendable refrigerants such as liquid carbon dioxide.

Antarctic Ice Tests

▶▶ ICE FROM ANTARCTICA is being used in geology research at the University of Michigan. Shipped from Antarctica earlier in the year, the ice arrived at Ann Arbor, Michigan by means of a specially equipped station wagon using dry ice as refrigerant, and the USS Arnab, a Navy cargo ship. U. S. Landing of the 40 ice Cores was at Davisville, Rhode Island. The total trip involved ten thousand miles.

News Of The Ice Industry

Northwest Association Met At Vancouver, B.C.

▶▶ ICEMEN of the Pacific Northwest met at Vancouver, B.C. late in March. Packaging and Merchandising were the principal topics. The association elected officers and scheduled a meeting to be held in Tacoma, Washington on Nov. 13, 1959. The next Northwest Convention is set for March 18, 1960 in Yakima.

Officers of the Northwest Association were re-elected for another term. They are: Ray Burgess, Rainier Ice & Cold Storage Co., Seattle, president; Bert Leach, Morrow Coal & Ice Co., Vancouver, B.C., vice-president; Lu Marsh, Koldkist Ice Co. Portland, secretary-treasurer.

The board of directors elected to serve with the incumbent officers consists of Jim Bennett, Tacoma Ice Co., Tacoma, Wash.; Flav Croteau, Ice Delivery Co., Spokane; Ken Davidson, Liberty Fuel & Ice Co., Portland; Bud Stone, Artificial Ice & Fuel Co., Yakima, and Bill Wilson, The B. Wilson Co. Ltd., Victoria, B.C.

In the industrial icing picture, a discussion centered around truck icing in the Yakima "Fruit Bowl of the Nation" area. Trucks are getting 40 percent of the transport business in that area, according to one speaker, and therefore their business, even though in small quantities is a factor to be recognized.

Illinois Ass'n Elects

▶▶ ANNUAL Spring Conference and Meeting of the Illinois Association of Ice Industries was held in Springfield, April 1. Officers elected were: President, Marvin Verry, Central Illinois Ice Co., Springfield; Vice-president, Robert Maginnis, Lincoln Boyle Ice Co., Chicago, and Secretary-Treasurer, W. D. Wright, Clinton, Ill.

Directors include Charles Lamb, chairman, Public Ice Service Co., Herrin; Robert Maginnis, Lincoln-Boyle Ice Co., Chicago; William Tolle, Tolle Ice Industries, Mattoon; Reed Smith, Peoria Service Co., Peoria; Marvin Verry, Central Illinois Ice Co., Springfield; John H. Glenn, Glenn Ice & Fuel Co., Beardstown; Roy H. Smith, Western Illinois Ice Co., Galesburg; Addison Buford, Southern Illinois Ice Co., Effingham; J. P. Maguire, City Products Co., Decatur, and Ray Ryan, Oscar Mayer Ice Service, Madison.

Flake Icemakers for New York Supply House

▶▶ SCHWEITZER Co., a poultry supply house in New York has installed two Flakemasters to meet its 7,000 lbs./day ice requirements. In an April release, the manufacturer described how Schweitzer's equipment was placed on special platforms within a 6x10x10 ft. high bin. Further, the manufacturer's engineers and a control organization's representative designed diagonal shutes for filling the bin. An electric eye was installed in the bin to shut off the machines when ice reaches eight feet.

Schweitzer is reported as installing the aforementioned equipment and accessories because the chopped variety of ice they were purchasing was too expensive—$5,000/yr.

The new installation not only manufactures the type of ice desired, it is reported, but prevents lumping which occurred with purchased ice.

Vacationers Directory

▶▶ NEW ENGLAND Ice Association members have an opportunity to list in a "Stop for Ice" directory. The booklet, of which some 50,000 are produced, is circulated among vacationers, tourists, sportsmen.

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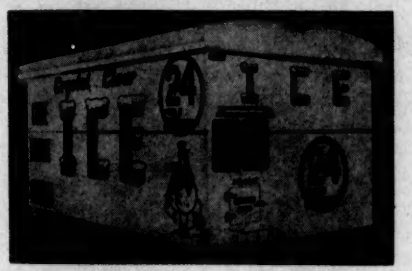

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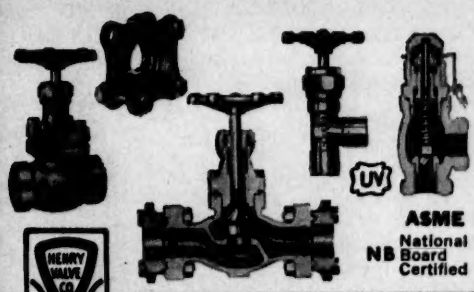

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VALVES AND ACCESSORIES FOR REFRIGERATION AND INDUSTRIAL APPLICATIONS

(Cont'd From Page 12)

TRRF Council, Membership Meetings

tunnel drying at a half cent per pound; puff drying costs range from one to three cents per pound; fifty percent of the cost of freeze drying represents about 98 percent of the moisture removal—the other half of the cost represents the final two percent moisture removal. Cost comparisons left the impression with industry members that this factor alone would probably promote refrigerated storage of freeze dehydrated foods, rather than room temperature storages which double production costs.

Deep Freeze the Bull

POSSIBLE SOURCE of new business for refrigerated warehousemen suggested to Garth A. Shoemaker president of TRRF, at the April meeting, was reported at the opening of the Friday sessions. It seems that last Fall, at the British Association for the Advancement of Science in London, one paper dealt with the distinct possibility of inducing suspended animation in humans by slow refrigeration process. Neither the British, nor Shoemaker were suggesting that the warehouseman expand his business by refrigerating *Homo sapiens*.

Instead it was suggested by the CANADIAN AGRICULTURAL COUNSELLOR, London, Ottawa, that this idea might be extended to the animal field. Instead of freezing semen for storage, the new idea is to freeze the bull. Dr. Parkes, of the National Institute for Medical Research, suggests that it is unnecessary to have the bull around eating his head off while he is being progeny-tested. Instead, he suggests keeping him on ice until it is found by testing his offspring whether he is worth keeping or not. But, Dr. Parkes said, "The study of immortality is necessarily a longer-term project".

Time and Temperature Tolerance of Frozen Foods

Second Scientific Advisory Council sessions dealt with discussion of Time-Temperature Tolerance of frozen foods, centering around what actually happens to foods that have partially thawed and then been refrozen. Dr. Copley led off the discussion, joined by Dr. Schultz, W. T. Pentzer of USDA, Dr. Fieger, Dr. Walter V. Price, Professor of Dairy and Food Industries, University of Wisconsin, and Joseph W. Slavin of the Fish and Wildlife Service.

Industry members presenting some of the questions were J. Kuehn, A. R. Carstensen, W. E. Martin. Dr. Walter Maclinn, Director of the Foundation, and Dr. J. G. Woodroof, also participated in some of the answers advanced. Mr. H. P. Smith, Director of Research, National Association of Frozen Food Packers, also contributed to the discussion by reviewing the proposed frozen food code of the Association of Food And Drug Officials of the United States (AFDOUS), which had been previously presented to the NAFFP Convention in Chicago.

Abuse Detectors

Kuehn submitted a question on refreezing a product; principally the temperature limits at which refreezing might be permissible. Carstensen raised the question of the warehouseman's liability in such a practice. Dr. Schultz described some of the chemical analysis that could be made to determine previous mis-treatment of a product. Dr. Maclinn brought out the fact that there were two very practical indicators available on the market, one of them being a strip of chemical temperature-sensitive paper, like a band-aid and the other being a small vial, containing a temperature sensitive chemical. Dr. Copley brought out the work of WURL, USDA, Albany, with telemeters for detecting temperature changes.

Heat Transfer and Packaging

Scientific Advisory Council meetings on Friday, April 3, tackled the heat transfer aspects of packaged goods and packaging pitfalls. Scientists with projects under way reported on what happens in coolers and freezers when they are shut up for the night, and described what happens to the atmosphere within those confines; also what happens to the commodity and its packaging. The second session elaborated on packaging materials, scientists pointing out what sort of material can cause grief for the warehouseman long before the commodity itself would present any sort of a problem.

Dr. Wm. H. Cook, National Research, Canada, reported on the control of relative humidity in freezers. His discussion primarily dealt with jacketed construction with which NRC has experimented. Joseph Slavin, U. S. Fish and Wildlife Service, added to the remarks in a brief description of experiments conducted by that branch in the same field, primarily with fish products. Cook related that the air circulation space between the inner and outer jackets was two inches, with air circulation from top to bottom proving it to be better than the original idea of circulating air from the bottom to the top of the space. Temperature gradient between the circulating air and the product in the jacket is 2 to 3F.

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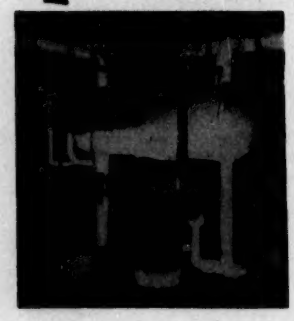

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For All Refrigerants

REFRIGERATION EQUIPMENT FOR MORE ECONOMICAL OPERATION

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This Canadian scientist reported construction of jacketed rooms to exceed standard erection cost approximately ten percent, while the U. S. representative estimated the additional cost at 20 percent by U. S. labor standards. There was indication that frost does build up on the inner walls of the jacketed room, near the doors or access. It was learned from Cook that an inner jacket of plywood rather than metal introduced "thermal inertia" which was desirable. Slavin, however, pointed out that a vapor barrier of some sort for the jacket was worth additional cost, permitting almost a 95 percent relative humidity.

Controlled Atmospheres Suggested For Study

Professor Kayan contributed to the heat transfer discussion relating his findings on the heat penetration through structures and the frost formation within the refrigerated areas as a result. In coolers he pointed out that instead of frost, liquid water collects in the voids promoting bacterial growth. He also defined enthalpy for the industry members present and suggested that the Foundation give some additional attention to rates of cooling, dimensional problems, such as heat transfers within cartons and further suggested studies of controlled atmosphere storages for other than just apples and pears.

Consultant Pushes Studies on Humidity and Defrosting

Consultant Edward Simons discussed the use of water and steam sprays to increase relative humidity at cooler temperatures. He pointed out also that steam had been used with some success at below freezing temperatures. Although it added desirable moisture to the air it also added to the sensible heat load. He cited some developments by the National Bureau of Standards for controlling humidities at low temperature and pointed out that the dollar cost is still the toughest problem.

Simons also dealt briefly with the curious phenomena reported by a number of warehousemen as occurring just after defrost cycles in their plants. Heavy refrigerated doors opened without mechanical or personnel operation. Simon attributed this to the fact that following the defrost cycle there was a certain amount of residual heat in the coil. The fan goes on and drives heat and moisture into the room. This builds up the pressure in the room which forces the doors open.

It is quite possible, he also related that this build-up of pressure within the room is the principal cause of breakdown in the insulation structure of many refrigerated rooms. He described a relief device consisting of a double plate flapper with a 5-watt heater for relieving pressure and also breaking vacuums in refrigerated storages of this nature. His discussion also led to a few remarks concerning air curtains for vertical frozen food cabinets, with dual jets to preclude outside air entrainment.

Regulated Environment Today's Warehouse Objective

Dr. Woodruff in the Scientific Council Session, pointed out that industry is finally getting over the idea that the refrigerated warehouse controls temperature alone. He pointed out how relative humidities have become very important and described how two- to three-year projects on military rations under controlled temperature and humidity had been extended from five to seven years with good stability of the product.

Armour & Co.'s Clarence Wiseman contributed remarks on turbo chilling. He related how super-saturated air at high velocity for carcass chilling had reduced shrinkage—as much as 0.7 percent on beef. He described how the research department of this packer had followed the carcasses in transport where it was learned that the original reduction in shrinkage was maintained. In reply to a question, he pointed out that the turbo-chill application would not be successful in connection with dry sausage.

Membership Meeting

Annual meeting of TRRF was held on Saturday, April 4. Dean Prescott, Chairman of the Foundation's Board of Governors, addressed the membership, relating highlights and the progress the Foundation had made in its 15 years. He paid particular tribute to Roy M. Hagen, president, California Consumers Corp., who passed away during the very week that the Foundation was meeting. Hagen had been president of TRRF from 1944 through 1946 and had been among the first to throw financial as well as personal support behind this research body. News of Hagen's passing saddened those in attendance who were otherwise inclined to celebrate the 15 years behind them.

Prescott also paid tribute to the late Dr. Mary Pennington who had also advised the Foundation in its earlier days. Dr. H. C. "Dutch" Diehl was also paid tribute by Dean Prescott for his 15 years of management of the Foundation. . . . More

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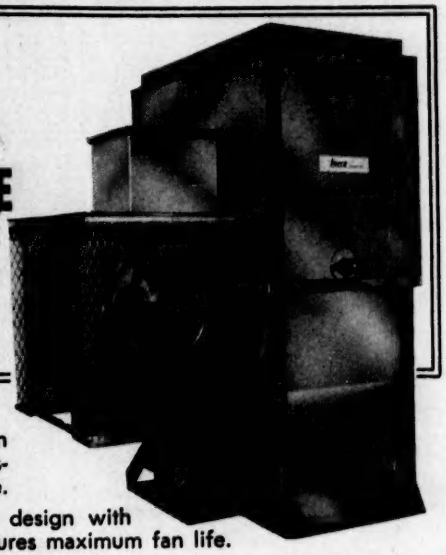

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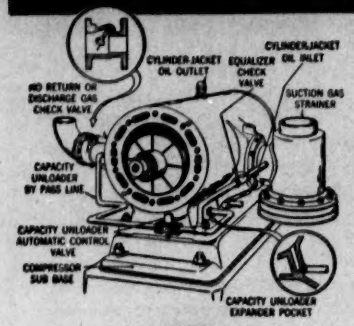

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Prescott related steps taken with Diehl's request to retire and the appointment of Dr. Walter A. Maclinn by the Foundation's executive committee, as "Dutch's" successor. He added a few remarks as to Maclinn's achievements in the short time he had been director.

Following Prescott, Gilbert J. Stecker, treasurer, reported on the financial status of the Foundation, submitting a detailed 3-page statement to the members in attendance. Associate chairman, Dean Schoenfeld, then reported on his recent eight months abroad, a personal venture to Europe. Of interest were his comments concerning the diligence of Russian scientists and their efforts to overtake the United States in the refrigeration field. Also of interest were comments that industrial countries of Europe were not tagging behind the U. S. Their applications of refrigeration to warehousing and to transportation in some instances were well ahead of the U.S.

Better Selling Job Required

Schoenfeld also commented on the new business possibilities that had been brought out in the Scientific Advisory Council meetings and pointed out that perhaps these could be spelled out a little more clearly for the industry. He thought perhaps the more skeptical firms in the industry would thus be persuaded to lend support through sustaining memberships in the Foundation.

Garth A. Shoemaker, president of the Foundation, opened his report by acquainting the members present with the fact that Dean Prescott celebrated his 87th anniversary on the day following the membership meeting. He took that opportunity to congratulate the Dean on his longevity and achievements in the interest of human welfare. He reiterated Schoenfeld's remarks that there was a lack of interest on the part of the entire warehousing industry in TRRF, with only approximately a quarter of eligibles supporting the Foundation.

Shoemaker reviewed a paper on marketing research by a well known analyst in Kansas City. Among the remarks he pointed out were to the effect that competition of the present and the future was not company vs. company, but industry vs. industry. On the other hand, he pointed out that for each old market which was passing into oblivion there were two new markets developing from research. By spelling out such facts for the entire industry, Shoemaker believed that more warehousemen could be persuaded to take advantage of the services offered.

Following Shoemaker's report Dr. Walter A. Maclinn made the annual report of the director. He passed over the customary history of the organization which is incorporated in his written report, copies of which are obtainable from the Foundation. He paid a tribute to his predecessor and launched into a brief review of the current studies and their importance. There were 21 studies in the current research program and Maclinn pointed out that each project is an investigation which will result in information worth dollars and cents to the warehouseman. (The printed report of the director also covers summaries of 42 Foundation sponsored studies which have been completed, as well as a Foundation publications list.)

Diehl Made Life Member

Governors of the Foundation, at a breakfast meeting on Sunday, April 5, elected Dr. H. C. "Dutch" Diehl to an Honorary Life Membership. Dr. Diehl is now Managing Director, Trans-Amer. Refrigerated Services.

Project Reports

Research projects sponsored, or in part supported by the Foundation, reported in the final and concluding session of the annual meeting included that covered by the Samuel Cate Prescott Fellowship Award. The awardee was J. N. McGill, working under Dr. R. T. Milner at the University of Illinois. His project was the Refrigerated Storage Life of Irradiated Chickens.

Irradiated Chicken

McGill related the experiences and observations of 12 treatments of pasteurizing doses of gamma rays. The irradiation took place both in air and under vacuum with both freezer and cooler samples. Rancidity developed with increased radiation doses. Irradiation odor seems to dissipate with storage life except with those samples processed in vacuum containers. There the odor remained acrid and disagreeable. Experiments in this field will continue in order to arrive at more definite conclusions.

Practical Defrosting

W. F. Stoecker, University of Illinois, reported on the Frost Formation on Refrigeration Coils. This was the second report by Stoecker, the previous report dealing with finned coil surfaces over which air is forced. The second report dealt with bare pipe with natural air convection. Bare pipe used in the experiment was 1¼ ips on 3½-in centers. A rule of thumb

concluded from the report could well be that defrosting is in order when the frost bridges over the adjacent pipes. That appeared to be the economic break-off point although refrigeration efficiency fell off sharply at 3/4-in. frost formation.

Stoecker dealt with a few of the advantages of natural air convection coils over the popular diffuser types, giving emphasis to the human and fan problems involved. One phenomena he related concerning the experiments was the fact that heat transfer increased about 0.2 Btu/hr. etc., up to the point where the film of ice on the pipe reached 0.4-in. thickness. He attributed the slight rise in heat transfer to an increase in the surface of the pipe brought about by the thin film of ice.

Irradiation Experiments

Dr. C. O. Ball, Rutgers University, reported on the Refrigerated Storage of Sterilized Foods. He compared loss of quality in sterilized canned juices, vegetables and soups, to the loss of quality in other forms of food process such as the conventional canning methods. Loss in quality appeared to be almost the same. Tomato juice, corn, peas, green beans, asparagus and four soups were tested. The tests were for taste, color and pH, and were conducted at several ranges of temperature. Part of the product was frozen before sterilization by radiation and another portion received HTST pasteurization. It appears that green foods will have to be frozen in order to hold color—the biggest problem not only with irradiation, but with canning as well.

Shelf and Package Life Extended By Dew Control

Condensation control on refrigerated commodities was the concluding report of the meeting. Dr. J. G. Woodroof, Georgia Experimental Station, related findings of the project to date. He emphasized the fact that condensation would take place at any time the warehouseman brings warm objects in contact with cold atmosphere. Dr. Woodroof pointed out that this could take place in the storing of warm products near cold products in the same room. He also pointed out the error of the popular conception to "store the product at such and such R.H."

The project report dealt with the 3-fold effect of condensation on metal, labels and packaging materials for canned commodities. Engineering and arranging are required for control of condensation. He pointed out that three requirements were necessary: (1) protective packaging materials (vapor barriers) are required; (2) condensation has to be re-evaporated as fast as it is formed, and (3) dry heat should be added.

Dr. Woodroof pointed out that there is a relationship between the density of the product and the amount of condensation, and a relationship also with regard to color or appearance of the containers. Maximum condensation occurs on aluminum and least on white metal objects. Black is rated next to aluminum in the amount of condensation occurring. Velocity of air adds a definite effect on the condensation cycle.

Sells To Oxnard Co-op

▶▶ VENTURA FARMS Frozen Foods, Inc., has become Oxnard Frozen Food Cooperative. Shareholders of the former firm voted in January to dissolve the corporation and sell its assets to the recently formed cooperative for $1.4 million dollars, cash.

Plant included a 500-ton capacity refrigeration system.

The Cooperative was just recently formed, and represents a $2 million dollar investment. Growers in Ventura County contributed funds for the first year of operation, according to the LOS ANGELES TIMES.

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1—Carrier Carene #1 85 ton capacity complete
2—10"x10" 4-cyl. York duplex DC to 225 h.p. motor.
1—9"x9" 4 cyl. York duplex DC to 150 h.p. motor.
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2—10"x10" 2 cyl. York DC to 125 h.p. motors.
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3"x3", 4"x4", 5"x5", 6"x6" compressors.
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Ice plants, 25 to 100 tons, York & Frick.
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WANTED — ammonia compressor, condenser, air units, etc. Please state age, size, price, etc. Address reply to Box MY-2, % Industrial Refrigeration.

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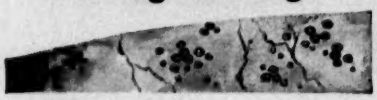

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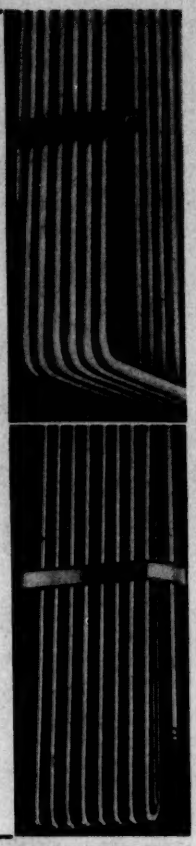

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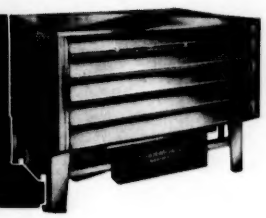
THROW YOUR COMPRESSOR *OUT!



*OUTSIDE, THAT IS!

KRAMER'S outdoor compressor is the *only* compressor designed to operate *outdoors* for *any* application under *all* temperatures and weather conditions.

Completely assembled, wired, tested and factory run-in, it arrives on the job ready to operate. Simple hookup eliminates costly installation and control adjustment time. Kramer's outdoor compressor ends waste of valuable indoor space.

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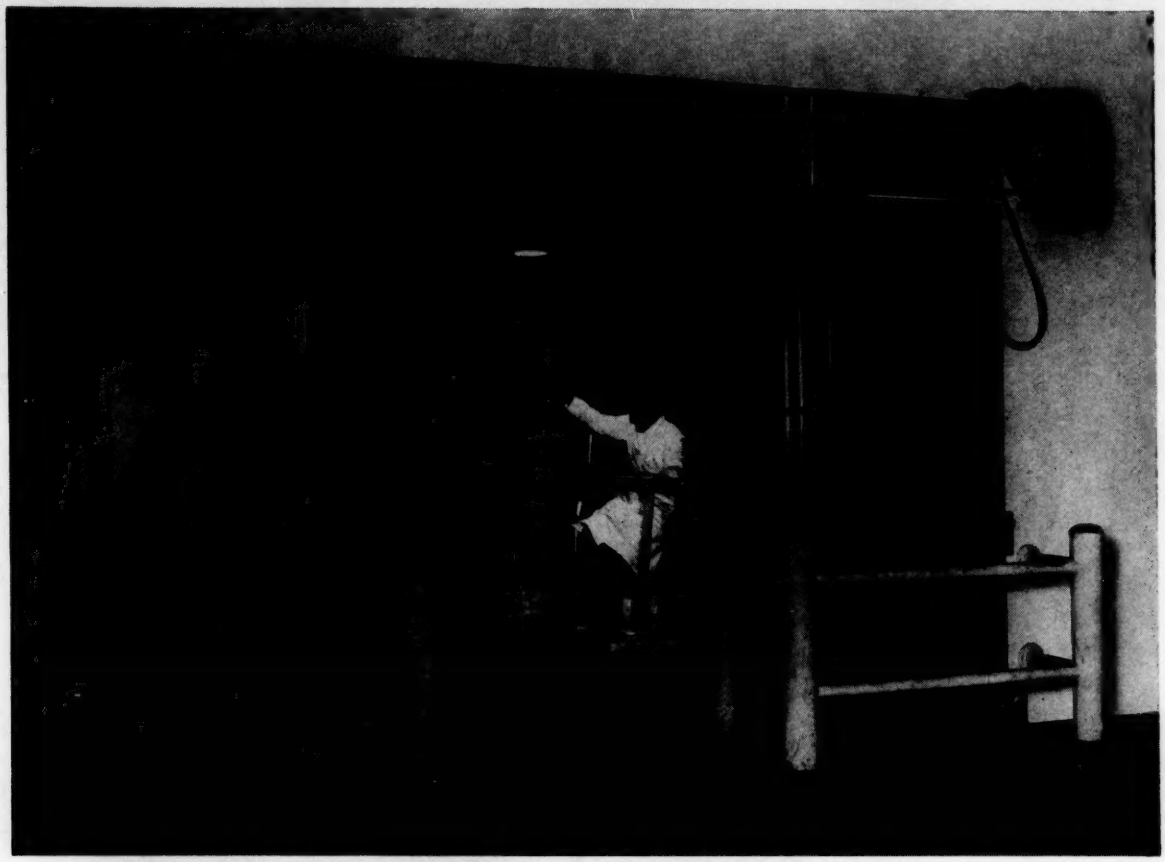
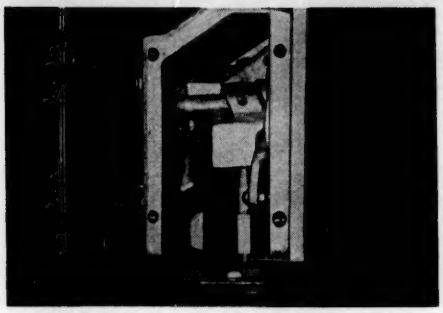
KRAMER TRENTON CO. • Trenton 5, N. J.

46 YEARS OF CONTINUOUS ACHIEVEMENT IN HEAT TRANSFER

New Jamison *Electroglide** Power Door speeds traffic, saves refrigeration *automatically!*



Electroglide offers famous Jamison Cold Storage Door quality and performance plus a completely new design for power operation. Both bi-parting and single leaf Electroglides are available to meet all job requirements.



EXCLUSIVE CAMLOK COMPRESSION SEAL—Jamison Camlok cams doors "in" against frame and "down" against floor at all points.

These other exclusive features mean dependable, smooth operation.

SHOCK ABSORBER CHAIN LINK—reduces wear and tear

SPRING LOADED SUSPENSION—minimizes power requirements

IMPROVED SAFETY EDGE—sensitive full height and full travel of door

SEALED-IN-OIL REDUCTION GEAR—trouble-free operation, minimum maintenance

High volume traffic can now speed on its way in busy cooler and freezer operations with minimum loss of refrigeration. Electroglide is specifically designed to accelerate truck movement with its instant automatic opening and closing.

Rapid smooth opening—Spring suspension helps doors open easily and smoothly. Doors move "out" and "up", riding on level tracks with gaskets clear of sill and frame.

Electroglide is made for both cooler and freezer use. Write today for new Electroglide bulletin to Jamison Cold Storage Door Co., Hagerstown, Md.

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COLD STORAGE DOORS